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**AMERICAN
ISTHMIAN CANAL**

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AN AMERICAN ISTHMIAN CANAL

AND

THE CHOICE OF ROUTES.

SPEECH

OF

HON. JOHN T. MORGAN,

OF ALABAMA,

IN THE

SENATE OF THE UNITED STATES,

April 17, 1902.

SENATE UNITED STATES.

PART OF CONG. RECORD—FREE.

THE AMERICAN ISTHMIAN CANAL AND THE
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NICARAGUA CANAL.

Mr. MORGAN. If there is no further business before the Senate, I should like to call attention to the notice I gave yesterday that I would request the indulgence of the Senate this morning to make some observations on the subject of the Nicaragua Canal. I ask that the bill be called up simply for that purpose. I do not propose to ask for its consideration this morning out of order.

The PRESIDENT pro tempore. The bill will be read by title.

The SECRETARY. A bill (H. R. 3110) to provide for the construction of a canal connecting the waters of the Atlantic and Pacific oceans.

Mr. MORGAN. Mr. President, there is but one class of enterprises projected in the United States that is free from the control of private interests and is intended only to promote the general welfare. It is the class of enterprises that, in some form, increase and facilitate ocean navigation. Such works are Government property and are guarded by every form of legal, judicial, and executive power against the intrusion of private interests.

All rivers, harbors, bays, and canals that aid the commerce of the country are free from private ownership and are open to the use of the people, upon equal terms.

This policy can not be reversed as to a ship canal to be constructed and owned by the United States to connect the great oceans without a breach of public faith.

Assuming that Congress is ready to undertake such a work in this spirit of sincere devotion to the welfare of the people and to realize the anxious hopes of all, except those who would profit by further delays, I will address myself on this occasion to the question of the choice of routes for an isthmian canal. It is a question of the greatest moment, and should be considered carefully, dispassionately, and with impartial sincerity.

A mistake made in the selection of a canal route which will or may involve the failure of the effort to construct a safe canal will be fatal.

A route that is safe for the construction and maintenance of a ship canal is the supreme consideration that should control the selection now to be made by Congress. The interest at stake and the expenditures involved are too great to justify the abandonment of a safe route for the sake of the possible saving of money in a less costly route that is of doubtful safety.

I wish to present the facts that bear directly upon this subject, not in full detail, but in just outline, for the consideration of the Senate, and will make quotations from the proofs, rather than statements of their substance, in what I now have to say on this subject.

In bringing the subject of an isthmian canal to the attention of the Senate in advance of the consideration of the subject by the vote of this body it is not my intention to discuss the merits of the measure passed by the House of Representatives and reported, without amendment, by the Committee on Interoceanic Canals, as a national or commercial question.

I will assume that the Senate, without material division of opinion, is convinced that a canal is an indispensable, national necessity, and that the people, with almost complete accord, are demanding it for that reason and for the additional reason that it will remove the obstructions to industry and commerce that have so long chained the right arm of their strength in almost helpless paralysis.

I also assume that the honest enthusiasm that moved the House of Representatives as one man to vote a second time for the Hepburn bill was not merely the result of thoughtless rejoicing that the Clayton-Bulwer treaty had been put aside and that the way was at last open to success, but that it was the result of long and mature study of the whole situation, and of a noble and patriotic impulse to accomplish a work that no other people could perform, for the benefit of the world. Blind zeal has never led in such toilsome work, where the dredge, the pick, and the shovel are the instruments of winning national honors, instead of the battle ship, the sword, and the rifle.

It is only a choice of methods and a comparison of national advantages that we are left to decide; all questions of financial ability, of private interests and preferences, of political bias, and other influences and antagonism having been relegated to the rear by the command of a free, honest, and powerful people.

The honor and the high duty of making this choice now belongs to Congress. In its performance, on my part, I will not permit any doubtful fact to sway my judgment, nor will I shrink from presenting the whole truth, as I believe it, under the pressure of any influence or the bias of preconceived opinions. It is to reach the logical results that should follow the actual merits of the claim of either canal route, in deciding the preference, that I will try to present an outline of the questions that now require discussion.

In this endeavor I will not attempt to discuss exhaustively any point I may state, but I will present some of the leading points which control my judgment, leaving their more complete presentation to others who have studied them with greater care and will discuss them with greater ability than I could bring to their consideration.

CERTAINTY OF SUCCESS IS THE TRUE FOUNDATION.

The subject presents itself to my mind with conclusive force in the form stated in the six propositions I will now state:

1. We have reached the point where investigation is complete by observation, experience, scientific research and forecast, and these means of knowledge are as conclusive of the facts as we could hope to make them in another half century of delay.

This knowledge of the controlling facts, as to the practicability of a canal through the American Isthmus, satisfies the people of the United States that the time for final action has come.

2. The question now to be decided is the choice of either of two routes for a canal; whether it shall be located at Panama, or

through the valley of the San Juan River, in Nicaragua and Costa Rica.

3. The controlling factor in making this selection is the assurance of success in constructing a canal that will be permanently useful for commerce, and for the needs of the Government and its policies, and for the benefit of the people of the United States.

4. A sum of money necessary for expenditure in the work of constructing such a canal, to accomplish such ends, can not be reasonably compared with the real value of the results to the people and the Government of the United States, and the choice of either route, with safe, intelligent, and sincere regard to its permanent usefulness and advantage, should not be controlled or affected by a difference in the present cost of construction.

An assumed or supposititious difference in the cost of construction of either canal that does not exceed \$6,000,000 is not a real factor in the choice of either route, if the route that it is cheapest to build is not the route that will give to the people and Government of the United States the most certain assurance of success in constructing a canal that will be permanent and the most useful for the industrial and commercial needs of the people and the most necessary for the Government in its domestic and foreign relations and its military and civil policies.

Yet, I will discuss the question of the estimated cost of the two canals, to remove, if I can, the impression that there is a real margin of expenditure in favor of the Panama route, the cost of which is estimated at \$184,233,358, if we should purchase that canal and the railroad alongside it, for \$40,000,000.

I will recur to this matter later on.

5. The assured certainty of success in the construction of a permanent canal is, of necessity, the basic or foundation fact upon which Congress must act in the selection of the canal route.

Considered as a simple proposition of civil engineering, there is no doubt—not even a shadow of doubt—as to any fact touching the practicability of a ship canal from Greytown to Brito, in and along the San Juan River and across Lake Nicaragua.

It is certain, beyond a reasonable doubt, that its cost is as nearly within the limits of exact estimates as any great public work that was ever undertaken.

As to this fact, there is no difference of opinion among the great number of engineers who have surveyed the Nicaragua route, or the boards and commissions that have studied and reported upon it, or the contractors who have examined and counted its cost in every element of calculation with a view to making contracts for its construction, or among the great engineers sent out by European countries to ascertain the feasibility of a proposed great highway of the world.

It is upon this ascertained and settled basis of certainty that I rest my judgment. I have been compelled to accept the conclusion that the Nicaragua route is the true and safe route to be adopted by Congress, and when I contrast it with the many and dangerous uncertainties of the Panama route, my judgment will not permit me to cast aside this assured success and this conclusive state of facts and, for the possible saving of \$5,630,704 in the estimated cost of constructing the canal, to imitate the dog in the fable, in dropping the bone from his mouth to seize its reflected image in the water he was crossing. *Æsop's* homely fable illustrates a danger that now threatens this august Senate.

6. If the dam at Bohio, on the Panama route, should fail for any cause, the only hope of a canal across that isthmus would perish, never to be restored. All engineers admit this fact.

The failure of a dam at Conchuda, or Boca San Carlos or at Ochoa, or at Tambogrande, or at any other site on the San Juan River, would only mean the loss of that structure, to be replaced on a better location if a lake-level canal is preferred.

A dam at Bohio is the only possible location for such a structure across the Chagres River; while there are many sites for dams across the San Juan River that will raise the water to the level of Lake Nicaragua and give 126.24 miles of lake-level navigation for all classes of vessels. Or if lake-level navigation in the San Juan River should be found impracticable, the resort to slack-water navigation, with low-level dams at its rapids, would substitute the present plan with one scarcely less desirable.

A SINGLE CHANCE OF SUCCESS IS TOO GREAT A RISK.

At Bohio there is but a solitary chance to employ the Chagres River for canal purposes, and that is shaken with many serious doubts in the minds of the same engineers who assert that no doubts impend over the San Juan route; and on this route there is an assured certainty of using the waters of Lake Nicaragua at many places for the construction of a dam for a permanent canal at the level of the lake.

These chances are at least ten to one, and if the risk is estimated only at tenfold the cost of the dam at Bohio it would deter the boldest gambler in futures from risking the possible loss of more than \$80,000,000 when, if he was successful, his profits could not exceed \$6,000,000.

But the loss of a dam at Bohio could not be less than \$144,233,-358 clear loss to the United States in cash, to say nothing of the lives wasted in the work, the incalculable loss to our commerce, and the national shame and despair that our people would suffer.

We are asked to stake too much upon the dam at Bohio, while we will, in all likelihood, if we choose that route, yield to others, either speculative Americans or jealous competitors for trade, the opportunity to seize upon the advantages which we have demonstrated to be certain on the Nicaragua route. That there may be no rational doubt that the United States has made this demonstration, at the cost of near \$2,000,000, I will present the following facts, which are undisputed:

THE CERTAINTY OF SUCCESS DEMONSTRATED AT NICARAGUA, ACCORDING
TO THE UNDISPUTED FACTS.

The Nicaragua Canal Commission, consisting of Rear-Admiral John G. Walker, president; Col. Peter C. Hains, Corps of Engineers, and Prof. Lewis M. Haupt, civil engineer, a graduate of West Point, was appointed in 1897. The Secretary of State issued final instructions to this Commission on November 3, 1897, closing as follows:

In other words, your report should be as full and conclusive upon the subject as it is practicable to make it, to the end that "the proper route, the feasibility and cost of construction of the Nicaragua Canal," may, if possible, be absolutely fixed and determined.

The Commission and its assistants, about 100 men, entered the field of work at Greytown December 5, 1897, and completed their examinations March 26 following, a period of nearly four months, leaving parties in the field at work acquiring additional data. Their report was completed May 9, 1899, and sent

to the President. They were commissioned August 2, 1897, and were closely engaged in this work until May 9, 1899—a period of one year and nine months. Their report has not been equaled by any subsequent report as to carefulness of statement, the breadth of inquiry, the precision of its measurements and estimates, and the clear and frank conclusions at which it arrived.

They say in their report that they spent five days in Panama “in examining the Panama Canal line, the work being done, and the plans, drawings, and data in the office of the company at Panama.”

The dimensions of the canal in Nicaragua, surveyed and located by this Commission, are as follows: In earth, 150 feet at bottom. In the river, 300 feet at bottom. The canal nowhere to be less than 30 feet deep. The entire cost, with 20 per cent added for contingencies, was estimated by Commissioners Walker and Haupt at \$118,133,790, and by Commissioner Hains at \$134,818,308.

In order to get this important report fairly before the Senate and the country, I present the following extracts from the text on pages 42, 43, under the head of “Feasibility,” and from pages 45, 46, under the head of “Conclusions:”

FEASIBILITY.

Under this division of the subject the Commission would respectfully submit that it has failed to find any competent authority that denies the feasibility of constructing a canal across Nicaragua.

The feasibility of the canal is conceded for the following reasons:

1. There are at this date sufficient precedents for ship canals capable of passing the largest vessels, so that any question of the navigation of such a channel is eliminated.

2. The ability to construct and operate locks of the requisite dimensions is sufficiently established by existing structures on the Manchester and Keil canals, at Davis Island on the Ohio, and at the St. Marys Canal, Michigan.

3. The possibility of constructing the necessary dams, weirs, sluices, and embankments which shall be sufficiently stable and impermeable to control the water required for navigation, as well as to regulate the floods, is within the resources of the engineering profession and is fully demonstrated by many hundreds of miles of embankments, levees, and dams both at home and abroad. There is no reason to doubt the ability to build them out of native rocks and earth and to give them the required strength and tightness to retain or to discharge the water with safety.

4. There is no question as to the adequacy of the supply of water for all purposes at all seasons, nor as to its control in times of floods.

5. Neither is there any doubt with reference to the ability to secure good supporting ground for the trunk of the canal nor suitable sites for locks and dams.

6. The harbor question is only a matter of money, and it is believed that good, capacious, and safe artificial harbors can be created at a reasonable cost. In brief, the Commission sees no reason to doubt the entire feasibility of the project, but it realizes the necessity of exercising due care in the preparation for the specifications and in the conduct of the work, and that the details of construction be thoroughly inspected and properly executed under competent supervision.

CONCLUSIONS.

The Commission after mature deliberation has adopted and estimated for the route from Brito to Lake Nicaragua, called the Childs route, variant No. 1, and from the lake to Greytown, that is called the Lull route, variant No. 1. This line leaving Brito follows the left bank of the Río Grande to near Buen Retiro, crosses the western divide to the valley of the Lajas, which it follows to Lake Nicaragua. Crossing the lake to the head of the San Juan River, it follows the upper river to near Boca San Carlos, thence, in excavation, by the left bank of the river to the San Juanillo, and across the low country to Greytown, passing to the northward of Lake Silico. It requires but a single dam, with regulating works at both ends of the summit level.

The new location selected for the dam at Boca San Carlos eliminates one of the most serious engineering difficulties by avoiding entirely the San Carlos River, with its torrential floods and large volume of sediment, and by locking down immediately from this dam the difficulties and risks of the high embankments of the Menocal line are also avoided.

Instead of the dam at La Flor a lock and regulating works have been

substituted at Buen Retiro, where the topography is well adapted for the purpose. It is also proposed to divide the surplus waters of the lake basin between the east and west sides, thus reducing the velocities in the San Juan and securing ample waste-way capacity for the maximum discharge that can ever occur, if stored and distributed over a short period of time. Ample provision has also been made for a possible fluctuation of the lake of 6 feet or more without injury to property by fixing the elevation of the bottom of the canal sufficiently low to cover seasons of minimum rainfall. The surveys have in general revealed better physical conditions than were heretofore supposed to exist, especially as to the amount of rock in the upper river, whereby it is possible greatly to reduce the estimated cost of construction. This fact will account largely for the comparatively moderate amount of the estimate when the enlarged dimensions of the project are taken into consideration. Other reductions are due to the improved methods and machinery available, as developed on the Chicago Drainage Canal, and which can not be ignored in discussing a work of this magnitude.

The creation of sufficiently capacious interior harbors presents no unusual difficulties, and they can be secured at a reasonable cost.

The field work, under the authority of this Commission, has been carefully and well done, and is believed to be all that is necessary for the preliminary location of a canal, and to determine, within narrow limits, the final location of dams, locks, and other constructions. Should a canal across Nicaragua be authorized it will be necessary to make further minute and careful investigations by borings to determine the exact location of locks and dams, for which the Commission has neither the time nor money, nor would it have been justified in doing work of this character until the construction of a canal was assured. The computations of amounts to be excavated have been carefully made and checked to guard against errors and are believed to be accurate within narrow limits. All possible information has been sought with regard to cost of similar work in the United States and in Central America, and a careful comparison made of the probable differences between Nicaragua and the United States.

To determine the proper unit prices for excavation the average of prices actually paid to contractors on the Chicago drainage canal, which represent cost of plant, prices paid for work done, and contractors' profits, were taken. Up to this point the Commission dealt only with facts. To the prices paid at Chicago certain percentages have been added for the difference in location, climate, etc. These percentages are, of course, a matter of judgment, upon which men may honestly differ. But from all the information obtainable by this Commission and after careful consideration, with a desire to arrive at a proper conclusion, those used in the estimate are deemed fair and reasonable.

In obtaining the estimate for cost of locks the prices actually paid for building the Government locks at the Sault Ste. Marie were taken, and 33 per cent was added for the difference of location. This percentage is believed to be ample, as a large part of the expense of constructing the locks will be for material, much of which can be furnished in Nicaragua at the same or only a small advance upon the prices in the United States.

After giving due weight to all the elements of this important question, and with an earnest desire to reach logical conclusions, based upon substantial facts, the Commission believes that a canal can be built across the Isthmus on this route for a sum not exceeding that stated in the estimate.

The dimensions of the canal proposed are much larger than any heretofore considered, and will be ample not only to meet the present requirements of commerce, but also for many years to come. A navigable channel of smaller dimensions than those proposed, only sufficient for present needs, can be constructed for a lesser sum, if deemed expedient.

The more reliable character of the work done in Nicaragua by this Commission than that done at Bohio, in Panama, by the Isthmian Canal Commission, is shown by the fact that the diamond drill was not used at Bohio, while it was used in all the borings made by the Nicaraguan Canal Commission.

ADDITIONAL STATEMENTS MADE BY THESE COMMISSIONS IN 1901.

These three commissioners were also members of the subsequent Isthmian Canal Commission, which was appointed on the 10th of June, 1899.

They made statements before the Committee on Interoceanic Canals on the 11th of May, 1900, touching their former report, in which Admiral Walker stated, in response to questions, as follows:

THE CHAIRMAN. Did you find any reason to depart from the report of the former Commission on the following subjects? I will state them seriatim:

Under the head of "Feasibility," you say in the former report:
 "Under this division of the subject the Commission would respectfully submit that it has failed to find any competent authority that denies the feasibility of constructing a canal across Nicaragua."

Have you, since that time, or did your Commission find any authority that denied the feasibility of the canal?

Admiral WALKER. As far as I know the opinions of the members of this Commission, they have no doubt that it is feasible to build a canal across Nicaragua.

The CHAIRMAN. You say:

"1. There are at this date sufficient precedents for ship canals capable of passing the largest vessels, so that any question of the navigation of such a channel is eliminated."

Are you still of that opinion?

Admiral WALKER. I am still of that opinion.

The CHAIRMAN. You say:

"2. The ability to construct and operate locks of the requisite dimensions is sufficiently established by existing structures on the Manchester and Kiel canals, at Davis Island, on the Ohio, and at the St. Mary Canal, Michigan."

I suppose you might add to that the drainage canal of Chicago?

Admiral WALKER. There are no locks on the drainage canal.

The CHAIRMAN. Do you still adhere to that opinion?

Admiral WALKER. Yes, sir; I am still of the same opinion.

The CHAIRMAN. You say:

3. "The possibility of constructing the necessary dams, weirs, sluices, and embankments which shall be sufficiently stable and impermeable to control the water required for navigation, as well as to regulate the floods, is within the resources of the engineering profession and is fully demonstrated by many hundreds of miles of embankments, levees, and dams, both at home and abroad. There is no reason to doubt the ability to build them out of the native rocks and earth and to give them the required strength and tightness to retain or to discharge the water with safety."

Do you still adhere to that opinion?

Admiral WALKER. Yes, sir.

The CHAIRMAN. You say again:

4. "There is no question as to the adequacy of the supply of water for all purposes at all seasons, nor as to its control in time of flood."

Do you still adhere to that opinion?

Admiral WALKER. I am still of that opinion.

The CHAIRMAN. That is the principal factor in the canal business, is it not?

Admiral WALKER. Those are pretty large factors; yes, sir.

The CHAIRMAN. You say further:

5. "Neither is there any doubt with reference to the ability to secure good supporting ground for the trunk of the canal nor suitable sites for locks and dams."

Do you still adhere to that view?

Admiral WALKER. I think that they can be found; yes.

The CHAIRMAN. You say:

6. "The harbor question is only a matter of money and it is believed that good, capacious, and safe artificial harbors can be created at a reasonable cost. In brief, this Commission sees no reason to doubt the entire feasibility of the project, but it realizes the necessity of due care in the preparation of the specifications and in the conduct of the work, and that the details of construction be properly executed under competent supervision. Do you adhere to that?"

Admiral WALKER. Yes, sir.

On that examination General Hains stated as follows:

The CHAIRMAN. General Hains, you were a member of the former Ludlow commission, were you not?

Colonel HAINS. No, sir; of the Walker Commission.

The CHAIRMAN. And you joined in the report, making a qualification of your estimate of the cost?

Colonel HAINS. Yes, sir.

The CHAIRMAN. You placed it above that of the other two associate commissioners?

Colonel HAINS. Yes, sir.

The CHAIRMAN. You went out and made an examination of the Nicaragua Canal again, did you, with the board?

Colonel HAINS. Yes, sir.

The CHAIRMAN. Have you any change to make showing a change of opinion on your part as to the feasibility and practicability of the Nicaragua route?

Colonel HAINS. No, sir.

Professor Haupt made the following statements:

Professor HAUPT. I did not accompany the Commission to Nicaragua or Panama.

The CHAIRMAN. So that your personal knowledge on the subject is such as you derived when you went there with the former Walker Commission?

Professor HAUPT. Yes, sir.

The CHAIRMAN. Have you made a study of this subject since you were out on that Commission—a close study of it?

Professor HAUPT. I have, sir, as far as the data were available.

The CHAIRMAN. Have you looked over the reports of the Walker Commission recently?

Professor HAUPT. No, sir; I have not revised them since publication.

The CHAIRMAN. From what you have heard the other engineer say here to-day, and from what you know of your personal examinations of the Nicaragua route, have you changed your opinions as expressed in that report?

Professor HAUPT. I have not, sir.

The CHAIRMAN. You see no reason for changing your opinion?

Professor HAUPT. No, sir.

The CHAIRMAN. Have you ever examined the Panama route?

Professor HAUPT. Yes, sir. The Walker Commission went over the route carefully and made a reconnaissance during the first Commission.

The CHAIRMAN. What length of time did you spend there?

Professor HAUPT. We spent there about a week, and had every facility that could be offered us by the railroad company, as well as the canal company, for the purpose.

The CHAIRMAN. In what year was that?

Professor HAUPT. That was in the year 1898, in the winter.

The CHAIRMAN. While the new company were at work?

Professor HAUPT. Yes, sir.

The CHAIRMAN. Did you see forces at work while you were there?

Professor HAUPT. They had about 3,000 men at work, it was claimed.

The CHAIRMAN. What part of the Panama Canal did you examine while you were out there?

Professor HAUPT. The entire route of the line of the canal, extending from Panama to Colon.

THESE STATEMENTS AGAIN CONFIRMED IN 1900 AND 1901.

On the 30th of November, 1900, the Isthmian Canal Commission, in their preliminary report to the President, recommended the Nicaragua route as "the most practicable and feasible route for a canal to be under the control, management, and ownership of the United States."

A year later, in their final report to the President, the Isthmian Canal Commission again recommended the Nicaragua route as the most practicable and feasible.

This should establish the leading and foundation fact on which the action of Congress may safely rest, that in Nicaragua there is a route that is assuredly feasible and practicable, and that if one plan of construction or one line of location of the canal should fail another location will be readily found to substitute it, or other dams can be built to supply the loss.

In the loss of a dam at Bohio the canal is lost; but if the dam at Conchuda is lost, the canal is only delayed.

On page 161 of their report the Isthmian Canal Commission say that—

A dam across the San Juan River at Machuca Rapids could be built more quickly and would cost much less than at Conchuda or any other point below Machuca; but a canal in the San Juan Valley, between Conchuda and Machuca, would be very expensive on account of the hilly character of the country.

These places are about 10 miles apart.

As to the one vital point in the Panama Canal, the dam at Bohio, and as to the dam at Conchuda, on the Nicaragua route—that being one of several dam sites on the San Juan River that are entirely practicable—Admiral Walker, in his examination under oath by the committee, made the following statements:

Senator HARRIS. The fact is with regard to the Bohio Dam that the future of that is just as much an unknown quantity as the future of the dam at Conchuda?

Admiral WALKER. I should say it was more of an uncertain feature. It is

a great work and a more difficult work to build. The Conchuda Dam I look upon as practically settled.

Senator HARRIS. So that we know no more about the possibilities and contingencies at Bohio than we do at Conchuda—in fact, less?

Admiral WALKER. We know less about the contingencies at Bohio, but that is the only point in the whole line about which we are at all uncertain.

Senator HARRIS. But that is the vital point?

Admiral WALKER. That is the vital point. Yes; it is vital to the canal, because the safety of the canal depends on the integrity of the dam in both cases.

Senator HARRIS. And the control of the river?

Admiral WALKER. Yes.

And on page 462 he stated as follows:

The CHAIRMAN. Do you remember any point or fact upon which you have changed your opinion with regard to this work from the beginning—from the time you first went to look at it—any point of fact upon which you have changed your opinion?

Admiral WALKER. Well, that would be pretty hard to answer. I went into the thing with my sympathies and prejudices, as far as I had any, in favor of the Nicaragua line, but I endeavored to take hold of this question with a mind open to proof.

The CHAIRMAN. I have no doubt that is so, but I want to know whether you have changed your mind upon any fact.

Admiral WALKER. I have changed it to this extent, that I now think that the best line is the Panama line, if that is a fact. That is an opinion; I do not think it a fact.

The CHAIRMAN. In an engineering sense?

Admiral WALKER. Yes; in an engineering sense.

The CHAIRMAN. Well, you come to that conclusion without changing any facts in your former statements?

Admiral WALKER. Yes.

The CHAIRMAN. Your judgment is convinced that you were in error in the first statement?

Admiral WALKER. No, sir; not at all. I have not changed my mind a particle.

The statement of Professor Haupt, who was a member of the Nicaragua Canal Commission, and also of the Isthmian Canal Commission, on the point of the assurance of success on the two routes is as follows:

Senator HARRIS. The entire safety and efficiency of the canal in each case depends on the dam?

Mr. HAUPT. Unquestionably. There is no dam on the western slope in either project, for the reason that the inclosing locks and their retaining walls constitute the retaining wall for the water on the west side of the summit levels, so that the question of dams there is not involved.

Senator HANNA. That is slack water.

Mr. HAUPT. Yes; for the summit level.

The CHAIRMAN. Now, the question that you just answered of Senator Harris's relates to a plan in which one dam is held to be sufficient on the Nicaragua route and one dam on the Panama route, does it not?

Mr. HAUPT. It does; yes, sir.

Senator HANNA. Is there any way of which you are aware by which more than one dam could be used or relied upon in the Panama route?

Mr. HAUPT. No, sir.

The CHAIRMAN. With dams at intervals?

Mr. HAUPT. No, sir; there is not.

The CHAIRMAN. In the Childs survey and in the Lull survey there were a number of dams across a single river, I believe.

Mr. HAUPT. Yes, sir.

The CHAIRMAN. Is that a practical method of constructing a canal?

Mr. HAUPT. Entirely so. That would reduce the height of the dam and the pressure or head of water and increase somewhat the expense and time of operation.

Senator HARRIS. It would require a greater number of locks?

Mr. HAUPT. Yes; if the lift is reduced.

The CHAIRMAN. If I remember it correctly, there was a dam at each of the rapids?

Mr. HAUPT. A dam at Machuca and one at Castillo, as well as others.

The CHAIRMAN. So that it is in an engineering sense practicable to build a canal on the San Juan River with several dams?

Mr. HAUPT. It is; yes, sir.

The CHAIRMAN. Whereas that is not practicable on the Panama route?

Mr. HAUPT. There was a dam proposed at Gamboa in an earlier plan, but it was found to be impracticable and it was abandoned, and Bohio is believed to be the only safe dam site of that route.

The CHAIRMAN. I am only asking your opinion as an engineer.

Gen. Peter C. Hains, who was a member of both commissions, testifies as follows:

The CHAIRMAN. Has Mr. Childs always been regarded by engineers as a good authority?

Colonel HAINS. Yes.

The CHAIRMAN. Have the accuracy and faithfulness of his surveys ever been questioned?

Colonel HAINS. Wherever we have had occasion to go over the same ground that he went over we have found that his work was generally reliable.

The CHAIRMAN. Where he established bench marks, your surveys corresponded?

Colonel HAINS. I do not know whether we found any of his bench marks. I doubt whether any of his bench marks were found at all. It is so long ago that I guess they have all disappeared.

The CHAIRMAN. Is that a practicable canal, that depth and that prism, running in the manner in which he surveyed it, for ships that would draw less than 17 feet of water?

Colonel HAINS. I do not think there is anything impracticable about it.

The CHAIRMAN. Mr. Childs's plan, if I remember it correctly, was for a dam at every one of the rapids of the San Juan River.

Colonel HAINS. Yes.

The CHAIRMAN. He took them one after the other and built low dams.

Colonel HAINS. Yes; put low dams in.

He further states:

The CHAIRMAN. The length of the canal in the Lull survey is 181.26 miles, according to the report. The prism of the canal in the earth, bottom width, was from 50 to 72 feet, according to conditions and circumstances.

Colonel HAINS. Yes.

The CHAIRMAN. In the rock it was 60 feet, and the depth of the canal was 26 feet. The locks were 70 by 400 feet, and there were 21 of them. I forgot to mention that in the Childs survey there were 28 locks.

Colonel HAINS. Different lifts.

The CHAIRMAN. Yes. Now, Lull's estimate was \$65,722,147, and his unit of prices for work in rock was \$1.25 to \$1.50; for earth work 35 cents, and for dredging 30 to 40 cents per cubic yard; for embankments 10 cents, and for concrete \$8 per cubic yard; for rock under water \$5 per cubic yard. Would that be a practicable canal at that depth, and with that prism, in those waters, across from ocean to ocean?

Colonel HAINS. Yes; if I have this project in my mind correctly.

The CHAIRMAN. Well, now, the Commission of which you were a member, the Nicaraguan Canal Commission—you were a member of that?

Colonel HAINS. Yes.

The CHAIRMAN. They estimated the length of route at 187.31 miles. You said that you had spent some months in making that survey.

Colonel HAINS. Yes, sir.

The CHAIRMAN. How long?

Colonel HAINS. You mean this last one?

The CHAIRMAN. No, sir; I mean the one that you and Mr. Haupt and Admiral Walker were on.

Colonel HAINS. I spent about three months down there.

The CHAIRMAN. About how many engineers did you have under your employment?

Colonel HAINS. I should say from 30 to 50; I don't remember.

The CHAIRMAN. Skilled engineers?

Colonel HAINS. Yes, sir.

The CHAIRMAN. About how many employees were there of all kinds, including the engineers.

Colonel HAINS. I do not remember. I suppose a couple of hundred—two or three hundred.

The CHAIRMAN. Well, you made a very careful survey, did you not?

Colonel HAINS. Yes.

The CHAIRMAN. One that you are willing to stand on and make recommendations on for spending money by the Government?

Colonel HAINS. Yes.

The CHAIRMAN. And you made a survey on a line of 187.31 miles, and then you had a bottom in earth of 150 feet and you had a bottom in rock of 150 feet and you had a depth of 30 feet. Your locks were 80 feet by 620 feet. Those locks would accommodate 90 per cent of the ships in the world now?

Colonel HAINS. Yes.

The CHAIRMAN. Maybe more. Then you had 10 locks, 5 on a side?

Colonel HAINS. Yes.

The CHAIRMAN. The time of passage you did not give, but you had an estimated cost of \$118,113,790?

Colonel HAINS. No; I did not.

The CHAIRMAN. I mean the Commission did—the majority?

Colonel HAINS. The majority of the Commission did; yes, sir.

The CHAIRMAN. And you dissented?

Colonel HAINS. Yes, sir.

The CHAIRMAN. And you put your price at what?

Colonel HAINS. About \$135,000,000.

The CHAIRMAN. So that the difference between you was between \$118,000,000 and \$135,000,000 for that construction?

Colonel HAINS. Yes.

The CHAIRMAN. Now, the unit prices that you adopted were as follows: In rock, \$1.03 to \$1.30 per cubic yard; in earth, 44 cents per cubic yard; in dredging, 20 to 30 cents per cubic yard, and the embankment you did not make any provision for. You did not make any estimate. For concrete, \$7.23, and for rock under water, \$5 a cubic yard. Now, was that a good canal? Where did you have your dam?

Colonel HAINS. Was it a good canal?

The CHAIRMAN. Yes; was that a safe, reliable canal?

Colonel HAINS. I think that it was a practicable canal.

The CHAIRMAN. And one that the Government could afford safely and reliably to build, and depend upon it to spend its money?

Colonel HAINS. Yes.

The CHAIRMAN. And one that would stay there after you put it there?

Colonel HAINS. Yes.

The CHAIRMAN. Where did you have your dam?

Colonel HAINS. At Boca San Carlos.

The CHAIRMAN. How high was it?

Colonel HAINS. I think it was about 110 to 120 feet in the deepest part; something like that.

Senator HARRIS. I have one more general question that I wish to ask you. Is there any engineering work on the Nicaragua line that is not easily within the limits of present engineering experience and knowledge?

Colonel HAINS. On the Nicaragua?

Senator HARRIS. Yes.

Colonel HAINS. I think not.

Senator HARRIS. There is no work there, either in the way of dams or locks or cuts, that involves any new and untried problems?

Colonel HAINS. No, sir.

Senator KITTREDGE. Is there on the Panama?

Colonel HAINS. I do not think there is in Panama, unless it is this dam.

Senator HARRIS. Well, I thought we had discussed that, and I will put the additional question and refer to what Mr. Morison says. Mr. Morison thought it involved "new and untried problems," the construction at this dam.

Colonel HAINS. Yes.

Senator HARRIS. And you agree with that?

Colonel HAINS. Yes; I agree with that.

Senator HANNA. Would you consider these untried problems as problems that could not be overcome in engineering?

Colonel HAINS. No, sir.

Senator HARRIS. Is there anything now among engineers that is not regarded as possible, given money enough and time enough?

Colonel HAINS. Very little.

Senator HANNA. Do you believe generally that the Bohio Dam, as recommended by the Commission, can be constructed for the amount of expenditure estimated?

Colonel HAINS. Yes; I think it can.

Senator HANNA. Your part of the work on this Commission was confined to Nicaragua—that is, you were on the committee that examined Nicaragua more specially?

Col. Oswald H. Ernst states as follows:

The CHAIRMAN. Now, there have been many lines run through Nicaragua along that line, commencing with the line run by Childs. That was a piece of engineering I have heard very highly applauded by engineers as being exact.

Colonel ERNST. Yes.

The CHAIRMAN. And Childs's survey has been taken as the basis of all the subsequent surveys, so far as his route corresponded with others?

Colonel ERNST. Yes, sir.

The CHAIRMAN. Childs put in a canal there with 17 feet depth of water, a harbor at Brito at the mouth of the little river there.

Colonel ERNST. The Rio Grande.

The CHAIRMAN. No, this way, at the lake—Las Lajas—and then at Greytown, but the bay was there at Greytown when he made his survey at deep water, and his survey included a slackwater navigation of the San Juan River, with dams at all the rapids—three or four dams—and he took his canal out in the vicinity of the mouth of the San Carlos, somewhere, and carried it through that level country down to Greytown. That was a safe canal, was it not?

Colonel ERNST. Well, I do not know about below the San Carlos. I think he would have had trouble below the San Carlos.

The CHAIRMAN. He did not have slack-water navigation below San Carlos, as I remember it.

Colonel ERNST. My recollection of it is that he had, but I may be mistaken.

The CHAIRMAN. But it was considered that that would have been a safe canal, if constructed, for ships drawing, say, 15 or 16 feet of water?

Colonel ERNST. Oh, I think so. I think that Childs would probably have changed his lines a little below the San Carlos, but, while I think so, I repeat that I think it was an admirable plan.

* * * * *

The CHAIRMAN. And then after Childs came Lull, and Mr. Menocal was his chief engineer, and they followed Childs's line, and adopted the slack-water system in that survey down to a point near the mouth of the San Carlos River, if I remember correctly, and then took the line through that low ground around to Greytown, where there was still a good harbor, or a fair harbor. That canal was 24 or 27 feet deep. I have the data somewhere here, but I have not got it so that I can refer to it just now. That would have been a safe canal, would it not?

Colonel ERNST. I think so.

The CHAIRMAN. Slack-water navigation. And it would have been a very useful canal to the commerce of the world, would it not?

Colonel ERNST. I should think it might.

The CHAIRMAN. With ships of the size then in vogue.

Colonel ERNST. If they had got it done before the ships increased too far. The trouble with all of our great enterprises is that before they are finished they are outgrown.

THE CERTAINTY OF SUCCESS CONFIRMED BY ALL THE COMMISSIONERS AS TO FIVE SEPARATE PLANS SURVEYED AND LOCATED.

We have surveyed, plotted, located down to the working point five or six canals through Nicaragua, at a cost to us of more than \$2,000,000, and we have demonstrated to the world that a canal can be built there for \$68,000,000, and I shall be greatly disappointed, if we should take the Panama Canal, if Nicaragua and Costa Rica are not able to find friends enough to build that canal and plank us out of 600 miles of length of line and take away from us our coastwise trade. I should dislike very much to risk as against my Government the energy and enterprise and sagacity of men who built railroads across this continent, when they undertook, if they should undertake to do it, to have a canal also to work in combination with them, and I should doubt very much the enterprise of these Frenchmen, if we should pay them \$40,000,000, and they should undertake to build one of these canals, even that located by Childs, by Lull, or by Menocal.

No member of either of the three commissions expressed a doubt or apprehension as to the certainty of the successful completion of a canal on the Nicaraguan route on either of five plans that have been adopted, surveyed, and located by the greatest engineers in America; from the slack-water plan of Childs, for a canal 17 feet deep, to the mammoth plan of the Isthmian Canal Commission, with a single dam at Conchuda to raise the San Juan River to the lake level, and to give unbroken summit-level navigation from Lock No. 4, which is 46 miles from the 6-fathom curve in the Caribbean Sea, to Lock No. 5, a length of 129.24 miles, in which there is only one curve with a radius of 4.045 feet, the other 26 curves being greater in radius, ranging from 4.297 to 17.189.

And no other engineer has seriously questioned the fact that within the limits of a reasonable cost a perfectly feasible and permanent canal can be constructed on the Nicaragua route.

MR. COOLEY'S OPINION AND ITS VALUE.

On the contrary, such an engineer as Lyman E. Cooley, who located and built the great Chicago drainage canal and many other public works, who examined both these routes in 1897-98, in company with other engineers and contractors, with the purpose of contracting to build the Nicaragua Canal, states as follows in respect of the certainty of success in constructing a canal on the Nicaragua route. After discussing questions of doubt as to the Panama route, as to which he had fewer engineering objections than some of the Isthmian Canal commissioners, he says:

The CHAIRMAN. Now, how many of these doubts and difficulties, if any, exist on the Nicaragua route?

Mr. COOLEY. Why, there is nothing about the matter as I have outlined it about which I have any doubts. A man in the face of a new problem feels, I imagine, as a general feels in the face of a battle; he does not like it, but he is up against it and he has got to fight it out. So, in regard to my mental attitude on the Nicaragua route, I have not nearly as many doubts about the building of a canal at Nicaragua as I had about the Chicago canal before we had actually let the contracts.

No statements of reports made in respect to this subject are of greater value than those made by this great engineer and canal constructor in his deposition.

He took what some designate as "a business view" of the subject, having great practical experience and great ability as an engineer and canal constructor, and no sentimental or official prepossessions to warp his judgment or to color his opinions.

MR. MENOCAL'S OPINION AND ITS VALUE.

Mr. Menocal, as the chief engineer of the Lull survey, made the first survey of a canal line at Panama in 1875, and pointed out, measured, and located the line for a lock canal that was adopted by the Panama company and is now adopted by the Isthmian Canal Commission, including the dams at Alhajuela and Bohio. The canal he projected was 24 feet deep and from 60 to 72 feet wide at bottom, with 22 locks. The summit level was 124 feet above sea level and it was 30 miles long. He had previously, in 1872, surveyed the Lull canal line through Nicaragua, as chief engineer of that expedition. The dimensions of the canals in the two surveys were only slightly different, so that he had the earliest opportunity to compare them.

In 1879 he was appointed a delegate to an international canal congress at Paris, by the President, in company with Admiral Daniel Ammen. At that meeting they pointed out the impossibility of maintaining a sea-level canal at Panama, and the advantages of the route through Nicaragua for a canal with locks.

In 1872, after the Lull survey of a canal at Panama, De Lesseps endeavored to obtain a concession for a canal from Nicaragua, which was refused. He then turned his attention to a sea-level canal at Panama. The warnings of Ammen and Menocal as to a sea-level canal at Panama were disregarded by the congress at Paris in May, 1879, and their verification has proven to be one of the severest financial blows a country ever received. In March, 1880, while De Lesseps was visiting the United States and was preparing his campaign of promotion for the sea-level canal, and organizing the "American committee," into whose hands were

paid 12,000,000 francs, he stated, before a committee of the House of Representatives, as follows:

There were fourteen projects of canals presented at the Paris congress, but the interest has centered entirely in the Nicaragua and Panama routes. As to the Nicaragua Canal, Mr. Menocal gave explanations of it to the committee as he had given to the Paris congress. One of the objections to that route was that it would be necessary first to construct a harbor at Brito, and another objection to it was that it was impossible by that route to make a sea-level canal. If it were determined to build a lock canal, and if there could not be a canal between the two oceans except a lock canal, then there was no doubt that the Nicaragua route was the best route.

Menocal personally surveyed both routes more than twenty years ago, and has since made two additional surveys of the Nicaragua route, one for the United States and the other for the Maritime Canal Company, besides his survey of the San Juan River and Greytown Harbor for the Government of Nicaragua.

No living man more thoroughly understands every engineering fact as to the Nicaragua route than he does. And few better understand the Panama route, on which he spent more than three months at work in the field, against two weeks of observation by the engineers of the Isthmian Canal Commission. Professor Haupt, of the Isthmian Canal Commission; Mr. Harvey, who planned and constructed the first locks at the Soo St. Mary's Canal, and made a close study of these routes; Lyman E. Cooley, who has studied both routes, on the ground, by careful inspection and careful examination, both as an engineering and as a "business proposition;" Mr. E. D. North, of New York, an eminent engineer; Mr. Trundle, who located the canal lines for the Nicaragua Canal Commission and for the Isthmian Canal Commission, and Gen. E. P. Alexander, the engineer who located the eastern boundary between Nicaragua and Costa Rica, all these and many more great engineers sustain Mr. Menocal's statement that there is no uncertainty as to the construction of a canal on the Nicaraguan route.

Mr. Menocal made the following statements in his deposition:

The CHAIRMAN. Now, you seem to be personally familiar with the ground of Panama, and also personally familiar with the ground of Nicaragua. You have stated how many surveys you have made there?

Mr. MENOCAL. Yes.

The CHAIRMAN. And how much attention you have given to the subject. Because of the surveys you have made at Nicaragua, have you discovered any point in your surveys which makes it doubtful as to the practicability of a canal there?

Mr. MENOCAL. I have not.

The CHAIRMAN. Do you feel certain, as an engineer, that a canal is practicable?

Mr. MENOCAL. I do.

The CHAIRMAN. On the Nicaragua River?

Mr. MENOCAL. I do.

The CHAIRMAN. Leaving the question of the selection of the lines aside entirely?

Mr. MENOCAL. Yes; I do under those conditions.

The CHAIRMAN. I ask you, from the survey that you first made down to the last survey that has been made there and reported, including the one you made across the divide, a short line, have you any reason as an engineer to believe that either of those surveys is impracticable?

Mr. MENOCAL. I have not.

Senator HARRIS. In addition to the fact of your personal knowledge, you are also familiar with the surveys and opinions that have been made by other engineers in regard to it?

Mr. MENOCAL. Yes.

Senator HARRIS. Have you ever heard of any engineer condemning the Nicaragua route as impracticable?

Mr. MENOCAL. I have not.

Senator HARRIS. My impression has been that it never has been pronounced anything but feasible.

Mr. MENOCAL. I never heard an engineer condemn it as impracticable. There have been several routes—

Senator HARRIS. Oh, there are variations, of course.

Mr. MENOCAL. Yes, variation; but every one of them is practicable.

Senator HARRIS. While we are on the Nicaragua line I would like to ask another question concerning that line. All of these various plans that have been proposed by yourself and all engineers contemplate the use of the upper part of the San Juan River, practicable for slack-water navigation?

Mr. MENOCAL. Yes.

Senator HARRIS. Do you not regard the curvature of that upper water of the San Juan under any of the plans that you have examined—that of the Commission most particularly—as impracticable or unsafe in any way?

Mr. MENOCAL. Oh, not at all. There is nothing impracticable in them. They are perfectly feasible.

Senator HARRIS. And that it is available for navigation at night with the ordinary electric light?

Mr. MENOCAL. Just as well as in the daytime; yes, sir.

Senator HARRIS. So that in the thirty-three hours described by the Commission as the time of passage will mean thirty-three continuous hours, and not portions of three days as suggested?

Mr. MENOCAL. There is no reason why it should not be so. It has always been contemplated by me that the canal would be navigated day and night.

Senator HARRIS. The same as the Suez Canal is?

Mr. MENOCAL. Precisely, just the same; better than the Suez Canal. The Suez Canal goes through shallow lakes also. They have had to excavate canals through these lakes, and they navigate the Suez Canal day and night.

Senator HARRIS. The channel can be so marked that there is no difficulty in navigating it at night?

Mr. MENOCAL. No, sir; especially in a country where you have no fogs.

Senator HARRIS. They have no fogs?

Mr. MENOCAL. No, sir; always a clear atmosphere, day and night.

Senator HARRIS. Reverting to the question we touched this morning a little, do you think that the minimum or the greatest curvature which is indicated by the Commission is such as to permit vessels to move around freely without the use of tugs to assist them?

Mr. MENOCAL. I do.

Senator HARRIS. And under their own steam?

Mr. MENOCAL. Yes.

Senator HARRIS. And how is it with sailing vessels through the upper part?

Mr. MENOCAL. They will have to be towed, except across the lake, where they can use sails as there is always a breeze on the lake.

Senator HARRIS. Of course, in the canal in every case?

Mr. MENOCAL. That will be the same in every canal.

The CHAIRMAN. Now, I want to ask, with your knowledge of hydraulic engineering, which is great, with regard to the double flight of locks, which is recommended at Bohio, with a maximum lift of 45 feet each; how does that compare with any other lock that you have knowledge of?

Mr. MENOCAL. That is a larger lift than that of any lock that has yet been built.

The CHAIRMAN. There has been no lock built with a lift of 45 feet?

Mr. MENOCAL. No, sir.

The CHAIRMAN. Is not the situation complicated by having a double flight; that is, two locks immediately after one another?

Mr. MENOCAL. Yes; I think the mechanical difficulties of building a lock of a 45-foot lift will be overcome, but when you come to put the two locks together the difficulties are increased.

The CHAIRMAN. That of course aggravates the situation?

Mr. MENOCAL. Yes; very much.

PREFERENCE FOR THE PANAMA ROUTE IS NOT BASED ON ANY DOUBT AS TO THE NICARAGUA ROUTE.

If the preference given to the Panama route in the supplementary report of the Isthmian Canal Commission was based upon any physical or engineering fact, or conjecture, or belief, or opinion that the Nicaragua route is not feasible or practicable, or that it is not safe, useful, or profitable to the people or Government of the United States, the weight of evidence against such a conclusion is overwhelming. But such is not the case as to any feature of the subject. The only ground stated for such a preference is the alleged excess of cost of the Nicaragua Canal, and the cost of maintenance over the cost of completing and maintain-

ing the Panama Canal and its purchase at \$40,000,000, which supposed gain in such a transaction is estimated at \$5,630,704.

This sum of money, not so great by one-half as we have expended on expositions in the last twenty-five years and less than one-fifth of the sum we have expended for Cuban independence and one-thirtieth part of what we have contributed for trans-continental railroads, is the bonus we are to receive for yielding forever the right already secured, if we choose to accept it, to construct a canal through Nicaragua and Costa Rica, which we have surveyed at a cost of at least \$2,000,000.

WE CAN NOT AFFORD TO SURRENDER THE NICARAGUA ROUTE.

This is a canal that we have demonstrated to be practicable, feasible, permanent, safe, useful, and necessary to the people and Government of the United States.

It is a canal route that will pass into other hands and will be constructed, beyond our power to prevent it, unless by the employment of force and the disgrace of our country. It will be a canal which, in the control of any other power, can be used against us as a heavy handicap on our coastwise trade, or as a sword thrust between our coast line and the right arm of our naval power engaged in protecting the Panama Canal, 500 miles distant. It need not be deeper than 30 feet or wider than 70 feet to accommodate steamers and sailing ships that will take from us the short line between the oceans.

There ought to be reasons that are imperative to cause us to surrender such a canal for a possible saving of \$5,630,704, but there are none that are either imperative or valuable, or that are inviting or well founded. On the contrary, there are facts, stubborn and inevitable, that block the way to the acquisition and use of the Panama Canal and railroad by the United States, not one of which can be removed by the expenditure of \$5,630,704.

The feasibility, practicability, usefulness, permanence, and commercial value of the Panama Canal to the United States, are all clouded with many doubts, either one of which detracts more than that sum from its value, if there was no other possible route with which it could be compared.

THE DOUBTS AS TO THE PANAMA ROUTE MUST BE AS COSTLY AS 20 PER CENT OF THE ESTIMATES REQUIRED TO CONSTRUCT IT.

Engineers, when they have measured and completed the work on the canal, including every item of cost within the 20 per cent allowance on unit prices, and for all other contingencies, and have examined their work and called it good, as to the Nicaragua route, can not reasonably ask Congress to estimate the doubts they can not clear up, in advance of actual construction of the canal at Panama, at a rate of less than 20 per cent of the whole cost of that canal. The uncertainty of success, in that case, is quite as great a percentage of risk as the contingencies of the cost of construction at Nicaragua.

On an expenditure of \$184,233,358, all of which may be lost, the contingency for doubts, an unknown quantity, at 20 per cent, is \$36,846,671, or, if only \$40,000,000 is at risk, the 20 per cent contingency for doubts is \$8,000,000, which sweeps off the proposed gain of \$5,630,704.

The existence of these doubts as to the Panama Canal is a substantial fact, a fact that can not be escaped, and the character of the doubts is such that they can only be resolved by actual ex-

perience in building, controlling, and maintaining the canal, and not by opinion in advance of construction, no matter what the weight of that opinion may be.

WHAT ARE THESE DOUBTS?

Some of the gravest of these doubts, as to engineering results, are admitted to be beyond the limit of all engineering experience. They are the conjectured opinions of enthusiastic engineers, and are not facts ascertained and demonstrated by actual engineering experience. The engineers on the Isthmian Canal Commission all admit that these doubts exist, and that they relate to unknown facts and untried experiments that are of vital importance. As, for instance, is pneumatic work indispensable at Bohio Dam?

This is scarcely a doubt, yet some of the engineers assert the opinion that it is not indispensable. If it is indispensable, can it be successfully done at Bohio dam?

All the engineers of the Commission are of the opinion that it can be done, while all admit that it can not be done without serious peril to human life, and all admit that it has never been accomplished under water at a depth of 127 feet. It is a forlorn hope of engineering audacity, and is most likely to find its Waterloo at Bohio.

Can these conditions be relieved by pumping? Pumping is, of old, the dernier resort of the Panamists. The comité d'études of the old company solemnly recommended pumping to supply the canal with water, and now an engineer commissioner recommends it to keep the water down to a level that will permit men at work to live under its pressure. Even freezing the Chagres waters around the caissons is coolly hinted at by some as the means of dredging under water at a depth of 127 feet.

Some of them say it can be relieved by pumping, and others are in doubt.

All the engineers, outside the Commission, refuse to accept the rock-bottom plan for a dam at Bohio, except General Abbott, and, while he is kindly disposed toward a rock dam if it can be built without too great cost, he prefers the clay dam of the comité technique, which they adopted because they doubted the practicability of reaching a rock foundation for the dam at Bohio.

The Culebra cut is a question of doubt, with its landslides, and creeping clays, and its indurated clay, that melts in water.

It is left expressly in doubt whether a dam at Alhajuela is necessary to control the floods in the Chagres River, and to supply the canal with water impounded there in reserve for the dry season; but all the engineers think it would be, at least, a good reliance in very dry weather.

Whether the Chagres River will repeat the floods of 1879 and remove, as it did then, the girders of the great steel bridge on the piers at Baracoa and flood the railroad track and the great swamps to the depth of 10 or 15 feet, and whether in such an event it can be shut out from the canal are matters of doubt. Whether any dam can stand such torrential floods and escape the fate of Johnstown and Austin are questions that only the Chagres River will settle in the course of time.

A safe harbor at Colon and the safe passage of ships through a submerged channel $3\frac{1}{4}$ miles long at Panama when the wind rises and the tide is at the ebb are matters of doubt. They are matters in which doubts are apt to be resolved by destruction, as they have often been resolved at Colon. The abandoned anchors in the

bay of Colon, left there by vessels that could not wait long enough to get them aboard when northerners drove heavy seas into the shallow bay, are mute witnesses to the reasons for such doubts.

All these doubts and many others that relate to the cost of maintenance and the time of transit of ships from our Atlantic to our Pacific ports are resolved by the opinion of a greater number of engineers, of at least equally high authority, against the Panama route.

These doubts can neither be removed nor compensated for by any sum of money saved in the estimates for a canal. Especially is the sum of \$5,630,704 insignificant when compared with these uncertainties.

The United States can not afford to take such risks in such serious matters for a supposititious gain of so small a sum.

Our people do not price their lives, or the prosperity of the 85,000,000 now concerned, or the hundreds of millions who will succeed them, at \$5,630,704, saved in a bargain that creates doubts as to the national integrity in the minds of the people of all nations, especially the people of France.

A DOUBT AS TO HEALTH THAT RESOLVES ALL OTHER DOUBTS AGAINST THE PANAMA ROUTE.

The health of the Panama route can not be safely classed with the matters of doubt. It is a fixed condition that is in constant warfare with human life. It depends upon natural conditions that are beyond remedy, and as a fatal impediment to a successful gateway for the world it is beyond doubt.

THE DOUBT IS NOT AS TO ITS PRESENCE AT PANAMA, BUT AS TO THE CHANCES OF ESCAPING IT.

The constant presence of yellow fever and Chagres fever is not alone due to the filthy condition of the cities of Panama and Colon or to the unclean habits of the people, nor is it due to mosquitoes. These are aggravations of fatal fevers, that make them epidemic, but the seat, the habitat, the permanent home of yellow fever and dengue, or "Chagres fever," is in the city of Panama and the adjacent coasts.

From that center they spread through a fostering atmosphere and are transmitted by the constant and close association of a large number of people at work in a narrow space of country along the railroad and the canal diggings or traveling through it. Spreading from the principal breeding ground at Panama, these fevers permeate the atmosphere of the canal belt and spread through the hot depression leading to Colon, poisoning the people along the entire route, and from these seaports they move out on the ships and attack all other ports. The yellow fever at Panama is hostile *humani generis*, and all the world can not conquer it.

The reasons are obvious. They are, certainly, three in number: First. The tide of 20 feet that rushes into the bay twice in twenty-four hours, bearing the refuse of the sea and decaying animal matter and leaving it to rot on the hot beach when it recedes. Second. The exposure of thousands of acres of mud flats to the sun when the tide goes out, to give off their pernicious exhalations. Third. The absence of winds to scatter or take the poisonous exhalations away from the beach and the Bay of Panama.

THE CAUSES ARE NATURAL AND PERMANENT.

When these natural causes are removed, Panama can be made comparatively as immune from yellow fever as Habana and Santiago de Cuba appear to be. But they are immovable.

The tides at the coasts of Cuba rise to the height of about 20 to 36 inches, and leave very small margins of sea bottom when they ebb; while those at Panama rise 18 to 21 feet, and when they go out they leave a naked and vast inclined plane of many square miles, covered with mud and ooze and sea slime, in which shellfish and sea animals abound, to die and decay under a hot sun. The average width of this exposed area, around the Bay and Gulf of Panama, is not less than two miles, and when the tide recedes it is uncovered and so remains for twelve hours at least. At night the cooler temperature condenses the poisoned air, and it infects all the coasts of that bay.

These facts have always been regarded as being so important to the world that they have become a part of the history of the bay and city of Panama.

A LUGUBRIOUS HISTORY FROM AN OFFICIAL SOURCE.

The final report of the Isthmian Canal Commission of November 30, 1901, treats of the health of the Panama route in the following strong, graphic, and just terms. They say, in their final report, page 70:

The climate of the isthmian canal regions is generally damp and enervating. The temperature is not extreme, rarely raising as high as 95° or falling below 70°, but the excessive humidity greatly restricts the capacity for physical exertion. The lowlands along the coast have long been known as insalubrious, and the seaports are subject to fevers. Perhaps the great difficulty to be encountered in the construction of the canal will be the procurement of an adequate force of laborers, and the preservation of their health and efficiency.

In this respect the Panama route has a lugubrious history, from which the Nicaragua route is free. The notorious mortality which attended the construction of the Panama Railroad and later the operations of the Panama Canal Company has taught a lesson which will not soon be forgotten for that route. Among the white employees of this Commission sent to Nicaragua there were fewer cases of sickness than there would probably have been among the same number of men employed in some parts of the United States. Among those sent to Panama the proportion of sick was greater. On the Nicaragua line during the operations of the Maritime Canal Company the health of the force was reported to be good.

This matter is so vital to the commercial world, to our coastwise line of traffic, to all travelers by way of the canal, and to the health of our seaports, that even this strong statement of the Commission is not a full and sufficient warning of the danger.

A MORE ANCIENT HISTORY, NOT LESS TRUE.

Capt. Bedford Pim, of the British navy, was sent along the Caribbean coast in 1861 to 1865 to ascertain its fitness for canal transit. Speaking of the country traversed by the line of railroad then in operation, he says:

The nature of the country through which the line of the road had to be carried was calculated to strike the hardest speculator with dismay.

The first 13 miles from the Atlantic led through deep swamps covered with jungle, full of reptiles and venomous insects. In all muddy places down to the verge of the ocean are impenetrable thickets formed of mangroves, which exhale putrid miasma. Farther on the line runs through a rugged country, over rapid rivers and all sorts of impediments, and after passing the summit, descends rapidly to the Pacific.

The climate was also sultry beyond almost any other part of the world, while, during the wet season the rains descended in a perfect deluge. Moreover, to crown all, the resources of the country were found to be nil, or nearly so, and consequently everything, especially labor, had to be imported.

In 1825 Robert B. Pitman published in London "A succinct view and analysis of authentic information extant in original works on the practicability of joining the Atlantic and Pacific oceans by a ship canal across the Isthmus of America."

In his book he makes extensive quotations from the books of travel written by men of high reputation as geographers and scientists.

On page 175, Pitman, a British historian and geographer, gives the following quotation from Dampier:

I have said before that the bays have a greater quantity of rain than the headlands. The Bay of Panama will furnish us with a proof of this by its immoderate rains, especially the south side of it, even from the Gulf of St. Michael to Cape St. Francis; the rains there are from April to November, but in June, July, and August they are most violent.

The same author, after giving a description of a distemper which proved fatal to above thirty of his crew, and which he attributes to bad water, adds:

I have observed that in hot countries land floods, which pour into the channels of rivers about the season of the rains, are very unwholesome, for when I lived in the Bay of Campeachy the fish were found dead in heaps on the shores of the rivers and creeks at such a season and many we took up half dead, of which sudden mortality there appeared no cause, but only the malignity of the waters draining off the land through thick woods and savannas of low grass and swampy grounds, with which some hot countries abound.

On page 179, Pitman quotes from Wafer as follows:

Wafer nearly agrees in this general description of the site of Panama. He says: "Between the River of Cheapo and Panama the land is low, even land; most of it is dry and covered here and there with short bushes. The town is surrounded with savannas, gentle flat hills, and courses of wood;" but, he adds, "the place is very sickly, though it lies in a country good enough; yet it is healthy in comparison with Portobello." Of the last-mentioned place, De Ulloa observes: "The heat is excessive, originated by the situation of the town, which is surrounded with high mountains, without any interval for the winds."

Pitman adds:

Walton has urged the unhealthiness of the damp and heated climate of this Isthmus as one of the greatest obstacles to the opening of a canal across it, and has stated that the climate of Cruces is infinitely more healthy than that of Panama. He says: "Disease is a barrier against settling on the Isthmus to improve it, and that persons who have withstood every other climate, there become languid; and although the negroes appear fat and hearty, and are possessed of personal strength to bear the heaviest burdens, yet want alone impels them to work.

BARON HUMBOLDT.

Pitman adds, on page 180, the following extracts from Baron Humboldt's writings in 1803. He says:

M. de Humboldt has the following passage on this division of the subject: "For fifty years back, the vomito (black vomit of the yellow fever) has never appeared on any point of the coast of the South Sea, with the exception of the town of Panama. It is situated on an arid tongue of land destitute of vegetation; but the tide, when it falls, leaves exposed for a great way into the bay, a large extent of ground, covered with fucus ulvae et medusae; the air is infected by the decomposition of so many organic substances; and miasmata, of very little influence on the organs of the natives, have a powerful effect on the individuals born in the cold regions of Europe or in those of the two Americas.

"The causes of the insalubrity of the air are very different on the two coasts of the Isthmus. At Panama, where the vomito is endemical and where the tides are very strong, the shore is considered as the origin of the infection. At Portobello, where remittent bilious fevers prevail and where the tides are scarcely sensible, the putrid emanations spring from the very strength of the vegetation. A few years ago the forests which cover the interior of the Isthmus extended to the very gates of the town; the salubrity of the air has considerably increased since the governor gave orders for clearing away the wood in the neighborhood. Of all places where the manchineel and the mangle vegetate with vigor, the most unhealthy are where the roots of those trees are not constantly covered with water."

THE MODERN HISTORY OF YELLOW FEVER AT PANAMA.

This is enough as to the history of Panama one hundred years ago, but it is far worse half a century later.

The yellow fever still dominates its ancient realm and will do so until the three miles of sloping bottom out from the beach in the bay of Panama is dug out, and until the tides cease to wash the dead matter of that great gulf ashore, and until the winds, with a steady offshore current, shall visit a coast along which for periods of many months at a time in every year they have persistently refused to blow.

In the forty years from 1850 to 1890, when the Isthmus drew into its narrow confines many thousands of people to work on the railroad and canal; the toilers, under the infatuation of high prices for labor; the contractors, seeking great profits at the expense of human life; the speculators and robbers, seeking prey, and the officers grasping for high salaries, crowded into the canal belt, and the yellow plague and beri beri and Chagres fever rioted in human destruction.

Such a history was never made elsewhere by the ravages of disease. It can be repeated and will be while the natural and irremediable conditions continue to exist in the bay of Panama, when the fevers are fed with people who are from temperate zones and are unacclimated.

ACTUAL AND SCIENTIFIC KNOWLEDGE.

Dr. John F. Bransford, a retired surgeon of the Navy, was surgeon to the Lull survey in Panama in December, 1875, and in Nicaragua in 1872-73, and was detailed on duty with the Smithsonian Institution in 1876-77, and at other times has made careful and extensive examinations of a scientific character in Nicaragua, Costa Rica, and Panama, including climatic and sanitary conditions, for which he is highly qualified.

In his deposition he states one cause for the permanent continuance of the yellow fever at Panama, and also for the fact that it has never appeared in Nicaragua along the proposed route of the canal, as follows:

Dr. BRANSFORD. I am quite sure the Isthmus of Panama is not a healthy country. That is the story of it, I think, always, everywhere. Up in the mountains of the interior it is all right; but along the Chagres River, and particularly along that Rio Grande which comes down near the line of the canal from the divide down to Panama, there is a great deal of mangrove swamp, and there is where we had our bad fever, where Mr. Tausig had his bad fever. That I consider a very unhealthy section. The trade wind does not blow home in the same way that it does in Nicaragua. The line of the Isthmus there is nearly east and west. Aspinwall is really west of Panama, and the trade winds are interfered with and deflected by the mountains east of Panama and the northern part of the State of Colombia, making a stagnation in the bay of Panama.

Senator HANNA. You spoke about yellow fever being prevalent at Panama. It has also been prevalent in Habana and Santiago de Cuba, has it not?

Dr. BRANSFORD. Yes.

Senator HANNA. Very severely?

Dr. BRANSFORD. Yes. If you will allow me, Senator, I may have used the word "prevalent," but what I meant was that cases were liable to occur at any time.

Senator HANNA. At any time of the year. I understood that. Well, after exercising proper sanitary methods in Habana and in other places in Cuba that trouble has been obviated very largely, has it not? Yellow fever has been reduced?

Dr. BRANSFORD. Yes.

Senator HANNA. The same thing applied in Panama would produce like results, would it not?

Dr. BRANSFORD. Well, it ought, as far as the yellow fever goes. I do not think anything will free the country of Panama fever.

The CHAIRMAN. Who was the chief engineer of Lull's expedition?

Dr. BRANSFORD. Mr. Menocal, and there was an engineer by the name of Crowell from Philadelphia, who was there also as an assistant.

The CHAIRMAN. Did you go ashore and remain ashore with the engineering party?

Dr. BRANSFORD. Yes; I was the medical officer of the surveying party.

The CHAIRMAN. That was the occasion when Lull made the survey of both routes, was it not, through Panama and also through Nicaragua?

Dr. BRANSFORD. I also went on another survey in 1875, with Captain Lull, when he surveyed the Panama route.

The CHAIRMAN. That was a separate survey?

Dr. BRANSFORD. Yes.

The CHAIRMAN. He made the Nicaragua survey first?

Dr. BRANSFORD. The Nicaragua survey first.

The CHAIRMAN. And then went to Panama?

Dr. BRANSFORD. Two years afterwards he went down and made the Panama survey.

The CHAIRMAN. Was he under the orders of the Government of the United States in making those surveys?

Dr. BRANSFORD. Yes; I was an assistant surgeon, and went as medical officer of both those surveys.

The CHAIRMAN. I will ask you to take up the Nicaragua line first; and I want to ask you in regard to the health of the country, the health of your party, and such facts as will give the committee a fair and just idea of what was the condition of the health of Nicaragua as affected by the climate or by any other consideration that you studied.

Dr. BRANSFORD. I had only two serious cases of illness among those men during that survey.

Senator KITTREDGE. How large a party was it?

Dr. BRANSFORD. Forty-five, first and last, but it averaged 36. There were only two serious cases of illness on that expedition. One was a lieutenant-commander, who had a sunstroke, and another was an old case of dysentery, which had existed before the man went there. We had a good many cases of malarial fever, none of a very serious character, except that they would recur. That is, a man would have a slight attack of chill and fever, and after he got well it would come back on him.

Senator HAWLEY. Did the complaints there take the form of diarrhea at all?

Dr. BRANSFORD. We were very free from any bowel trouble at all, sir, very. The bulk of my practice was with light cases of malarial fever. We were there from the 20th of December until the 6th of July, and, as I said before, there were only two serious cases. Of course, there was malarial fever in the swamps, particularly there in the neighborhood of Greytown; but I think that the country generally is about as healthy as any tropical country that I have known.

The CHAIRMAN. In your practice there as surgeon of that party did you keep up with the body of the engineers who were surveying—the workmen?

Dr. BRANSFORD. I lived in one camp or another. They were divided into several parties, and I would go from one party to another, according to the necessities of my profession. Sometimes I would be with one party and sometimes with the other, but I was in the field all the time with one or the other of the parties.

The CHAIRMAN. Did you make any observations of climatic conditions, as to winds and other things?

Dr. BRANSFORD. The prevailing wind there is the trade wind. It is right in the trade-wind belt, and that is the prevailing wind pretty much the year round. It was much stronger in the dry season than in the wet season, but it blows home. I think the *Ranger*, a few years afterwards, on the west coast, found that the wind was to the east, northeast, or southeast for two hundred and eighty-three days during the year that she was there. That is the usual and prevailing wind. Occasionally in the wet season the wind hauled around to the southwest, and then heavy rains came.

The CHAIRMAN. Does that wind continue through the entire opening there up the San Juan River and the lakes and across to Brito?

Dr. BRANSFORD. All the way across the Pacific. It blows down in very heavy gusts on the Pacific side, which they call papagoyos, down the gulches at San Juan del Sur and Brito. The winds are often very strong, and the wind reaches all the way across.

The divide in Nicaragua runs about northwest and southeast, right across the track of the trade winds. The trade wind usually is east-northeast, and the line of that canal from Greytown to Brito is very nearly east and west, a little bit northwest from Greytown, but so nearly east and west that the wind draws right through that gap, and, in my opinion, is the most important factor in the health conditions along that route.

Senator HANNA. At about what rate does the trade wind blow there; how many miles per hour?

Dr. BRANSFORD. I do not know, sir; I could not say; but it usually commences up to the northeast and blows very strong for two or three days, sometimes four or five days, and then moves down toward the east and dies out a little and then shifts back again. I know that when I was there in 1876 and 1877—I was also in Nicaragua on duty connected with the Smith-

sonian Institution—very often the winds blew so strong, when I was on the west side of the lake, that I would not be able to go to Ometepe Island, where I was at work, for two or three days at a time sometimes.

The CHAIRMAN. What did you say you were doing on these last two occasions?

Dr. BRANSFORD. I went down at the request of the Smithsonian Institution on special duty, alone, on exploring duty for the Smithsonian Institution.

If Congress chooses to reinstate the horrors of Panama, the motive or the consideration should be something greater than the possible saving of \$5,630,704 in the construction of a canal.

PRACTICAL EXPERIENCE.

The true history of the death rate at Panama was never written. It has been suppressed. At this date we can find but few men who knew and participated in that holocaust among the laborers who were stricken, to tell even what one man could see and know of these great battles with "the destruction that wasteth at night, and the pestilence that walketh at noonday."

The lives of the survivors were shortened and they have nearly all passed away. They were probably 30 years old, on an average, at that time, and if they were now living they would be from 60 to 80 years old.

One of the participants informed the committee of his personal knowledge of this matter, and, though he is old and sick from disease he there contracted, he came to Washington to testify, declaring that he had no personal interest to subserve, but that he is deeply concerned that his Government should not create the opportunity for repeating the terrible history of Panama. For nearly six years he was the track master of the Panama Railroad, and was constantly in contact with the laborers who, in great numbers, were at work on the railroad and the canal at Panama.

Mr. Plume states the following facts. His service with the Panama Railroad Company was from 1883 to 1888.

The CHAIRMAN. How many hands did you have under you as a rule—about an average?

Mr. PLUME. I had 10 men to every section, and a section run 4 to 5 miles.

The CHAIRMAN. About how many people did the canal company have there while you stayed there?

Mr. PLUME. Well, it was estimated that they had 10,000, but I doubt very much if 5,000 were working. The labor is of such a class that it is utterly impossible to get them to work; it is this lazy, good-for-nothing Jamaica labor, and the climate there is so bad that a man can not work.

The CHAIRMAN. Well, now, I want to get at that, and I want you now to be careful in your statements about that. Did you have any trouble in preserving the health of the party under your control—these 10 men to a section?

Mr. PLUME. Oh, a great deal, sir.

The CHAIRMAN. What was the average amount of loss per annum, say during the five or six years you were there, out of your own party, now?

Mr. PLUME. Well, every month or two I would lose a man, perhaps two men. I will explain it to you. If a man gets wet there with the rain he is sure to be sick the next morning. The dew commences to fall at 3.30 o'clock in the afternoon, and if a man gets his clothes wet with this dew and he goes to bed with his clothes on, as sure as he is born he will wake up sick the next morning. I never saw such a climate in all my life, and I have worked in the rice fields of South Carolina, and gracious only knows that is bad enough.

The CHAIRMAN. Can you give the committee some idea of the condition of health of these canal laborers during the time you were in this Isthmus?

Mr. PLUME. When I went there we used to run one train—perhaps it would be a car or two box cars—in the morning out of Colon up to Monkey Hill. Our graveyard is about 5 miles from Colon, on a hill called Monkey Hill, but I had not been there a year when we were up there. Over to Panama it was the same way—bury, bury, bury, running two, three, and four trains a day with dead Jamaica niggers all the time. I never saw anything like it. It did not make any difference whether they were black or white, to see the way they died there! They die like animals.

The CHAIRMAN. Of what diseases would they die, if you know anything about it?

Mr. PLUME. There are four most deadly fevers. There is the yellow fever, the pernicious fever, the putrid fever, and the typhoid fever, and the intermittent fever. If the intermittent runs long enough it will turn into typhoid or those other bad fevers. A man will only last three or four days, unless they have pretty quick and pretty severe treatment.

The CHAIRMAN. Did the Panama Canal Company have good shelter for its hands and good hospitals?

Mr. PLUME. Yes, there is no finer hospital on the globe than the one they have at Panama. It is on the side of the Ancon Mountain, which used to be a volcano several centuries ago, and the lava from the volcano went across Panama and out into the bay about a mile. The hospital is a splendid thing. It is said to have cost \$5,000,000, and I guess it did. Down in this valley you dig a hole about two feet deep and you come to a boiling spring, right under the mountains, and they have engines there pumping water up to this hospital. There is a man in Panama who has a concession to bury people. He opened a graveyard, I suppose 300 feet one way and 400 the other. Every grave is numbered that they may know who is buried there. In exactly one year after he opened it I drove by there, and there were 1,875 crosses in that burying ground, and that does not count the men that were in the ovens. They have ovens along the wall, a brick wall, and they bury people in there who can afford to pay for it; but there were 1,875 crosses in that burying ground, to give you a little idea of the health of the country.

The CHAIRMAN. About what year was that?

Mr. PLUME. That was in the early part of 1887. De Lesseps brought out 57 men there for engineers, chiefs of sections, and for different purposes, clerks. In three months, sir, there were only 3 of them left. I never saw anything like it in my life. If a man drinks there, he is just as sure to die as he is alive; it is fatal; and here is something very wonderful: I have always noticed if a Frenchman gets one of those fevers, he is just as sure to die as he has a hair on his head. The doctors have told me that it is on account of their having drunk so much of this French claret in France, which is full of logwood, and it has burned the linings of their stomachs, and as soon as they get a fever they die. My allowance of quinine was an ounce, and it would last me three weeks. That is what affected my hearing.

The CHAIRMAN. You suffer from it yet?

Mr. PLUME. What is that?

The CHAIRMAN. You suffer from it yet?

Mr. PLUME. Oh, yes, and never will get over it. I always took medicine, kept my liver clean, and that is the way I kept on my feet; and when I left that climate and came here a doctor worked six days and six nights on me to save my life. My brother-in-law told me that I must have a constitution of iron, and I believe I have.

OFFICERS OF THE PANAMA COMPANY TESTIFY.

Mr. Colné, who was the agent for the old company in America, states that the hospital expenses, not including the buildings, was \$4,548,127 from 1881 to 1890, of which sum \$680,000 was for medicine.

General Abbott testified that during the same period the annual average percentage of diseases at Panama was, for diseases of Europe, 18.83, and of diseases due to climate the percentage was 47.24. This related to cases treated in the hospitals, and proves that the local diseases were epidemic.

General Abbott tells of another "lugubrious" situation, as to the railroad laborers, as follows:

Now, I will offer all that I have been able to collect with reference to health on the Panama Railroad. There was a fearful loss of life during the construction of the railroad. I passed over the route in 1855, just after it had been finished. The surgeon of the steamer had been employed on the line, and he told me much about it. He said the conditions were something frightful—that they had to contend not only with disease, but with suicide. A great many coolies had been imported, and they were very unhappy and wanted to get back to China. They had an idea if they committed suicide they would go back.

The surgeon said it was necessary to watch them with the greatest care; that if a Chinaman found a little puddle of water he would hold his face down into it until he drowned, without exciting the attention or notice of anyone. The excessive death rate was due, doubtless, not only to the climate, but also to the conditions and to the various races that were tried. It was not then known that the heavy work should be done by negroes. I have no idea that anything like the mortality then encountered will be repeated on any isthmian line.

The CHAIRMAN. You never heard of a Chinaman committing suicide in Washington, did you?

If it had occurred to General Abbott to state that the name of the railroad station at Matachin means "dead Chinese," he would have been able to account for the fact that Chinese, when taken with the fever, would slip away from observation and drown themselves in puddles of water.

A NAVAL OFFICER TESTIFIES.

Commander Lucien Young states in his deposition as follows:

The most unhealthy place on earth is the Isthmus of Panama. I had yellow fever myself in Panama, and I have seen them dying by the wholesale; and so far as yellow fever is concerned, I would rather be in Habana than in Panama.

This evidence, with much more that it is unnecessary to quote, establishes the fact that yellow fever is indigenous at Panama and other localities of the canal route; that it is of malignant type and can not be extirpated, because it is the result of natural causes that human agencies can not change.

If the choice of routes for a canal depended upon this one fact, we would certainly be wise to turn to the Nicaragua route, even at an excess of cost amounting to \$5,630,704.

One duty that the Government owes to humanity—which rises above all other personal considerations—in the choice of these routes is the care of the health and lives of men whose labor is the real power that must open this great waterway. No Senator can be indifferent to this demand of duty, nor can the Senate afford to take the risk of repeating the history of Panama during the thirty years of human sacrifice that have made it so lugubrious.

THE HEALTH CONTRAST BETWEEN THE TWO ROUTES.

If every other consideration of advantage was in favor of the Panama route, the salubrity of climate and the natural conditions that assure the health of Nicaragua would determine the choice in favor of that route. The contrast between these localities as places of abode gives great weight to the argument in favor of Nicaragua.

All maritime and civilized nations will use an isthmian canal, not alone for ships of war and commerce, but for migration and travel around the world and to and from every coast and seaport of every country, all of which will be brought by it into direct and unobstructed communication by the canal. The myriads of people of coming generations that will pass through a canal cut through the American Isthmus will have the right to reproach this Congress and will not fail to do so if we select for them a route on which pestilence lurks by the wayside, instead of a route that nature has made free from such dangers.

The saving of \$5,630,704 will appear to them as a paltry consideration for the choice of a fever-breeding ground, when a healthy and attractive route for a canal is offered.

THE WALKER NICARAGUA CANAL COMMISSION'S REPORT OF 1899.

This question is not new. It arose at the first moment of a choice between these routes, as long ago as the sixteenth century. It was carefully studied by our Nicaragua Canal Commission, of which Admiral Walker was president, in 1897-1899, in view of objections then urged by the Panama Canal Company

and others to the Nicaragua route, and the following answer was made by that Commission:

The impression that this portion of the Isthmus is unusually unhealthy is erroneous. On the contrary, the local conditions are such that with ordinary hygienic precautions the risks from disease are slight.

The frequent rainfall on the east coast furnishes an ample supply of fresh, soft water, condensed directly from the clouds. The porous, sandy soil absorbs it so rapidly as to prevent stagnation, while the animal refuse is quickly removed by the scavenger birds and fish continually on the alert for food.

With their light, loose clothing, vegetable diet, and cleanly habits, the natives seldom suffer from fevers. Even our unacclimated Americans, passing from a rigorous winter temperature to the mild region of the trade winds, were, with few exceptions, exempt from febrile complaints, and amongst the large number of engineers sent out there was no mortality in the country. The constant motion of the wind, sweeping through this low divide, appears to remove the noxious exhalations which characterize other portions of the Isthmus.

Yellow fever finds no habitat at Greytown, and even when imported does not become epidemic. Abstemious habits and careful police of camps will insure as good health among laborers as will be found in many locations in this country. The climate would affect the labor question, therefore, chiefly by the lassitude resulting from its enervating influence.

Assistant Engineer Stewart says that—

"The atmospheric conditions are excellent, and for the seven months we were in the field we worked in all conditions of weather, losing but one entire day on account of a heavy downpour of twelve hours."

The narrow limits within which the temperature ranges are shown from a few selected observations at various stations during the year as below. The Rio Viejo station is located on the western slope of the Cordilleras, east of the lake, and at a higher altitude than the others. Hence its greater range of 30 degrees. This uniformity of temperature is one of the important factors in the consideration in the permanency of important works as well as in the health of the inhabitants.

It would be quite sufficient to stop at this conclusive statement, against which no fact is stated, but the subject was again opened on the hearings before the Committee on Inter-oceanic Canals, and some opinions were stated that the cutting of a canal in Nicaragua might produce health conditions there like those that exist at Panama.

WILL NICARAGUA FALL A PREY TO DISEASE LIKE PANAMA?

The importance of the subject justifies a brief statement of the facts deposed to by the witnesses before the committee. Dr. Bransford, whose statements as to the health of Panama and Nicaragua I have read to the Senate, has actual, personal, and scientific knowledge of this subject, makes the following statements as to Nicaragua:

The CHAIRMAN. How long did you remain on these two latter visits?

Dr. BRANSFORD. I think I went down each time in January and stayed until June. I am not absolutely sure of it, but that was about the time, from January to June, in 1876 and also in 1877. Then in 1881 I was down there again for the Smithsonian Institution, in Guatemala, Nicaragua, and Costa Rica.

The CHAIRMAN. What particular duty were you on then?

Dr. BRANSFORD. The same duty, examining the remains of the Indian inhabitants.

The CHAIRMAN. Were you much over the country while you were down there?

Dr. BRANSFORD. All the time. I was in the interior.

The CHAIRMAN. What kind of country—agriculturally, topographically, and with reference to climatic considerations—is Nicaragua?

Dr. BRANSFORD. Well, conditions are entirely different on the two slopes. On the Atlantic slope it is heavily wooded, and there is a much heavier rainfall than on the Pacific. Most of the population is on the Pacific side of the main range of mountains. The country along the route of the canal from Lake Nicaragua to Brito is one of the finest agricultural countries I have ever seen. Rivas is the principal town. There are half a dozen smaller towns around it, and the whole of that country from the lake to the coast mountains, a distance of some 8 or 10 miles, is a garden spot for tropical fruits, chocolate, sugar cane, and fruits of all kinds.

The CHAIRMAN. What kind of a population has it, with reference to industry, quietude, and general disposition?

Dr. BRANSFORD. The ruling portion of the population is the usual mixture of Spanish and Indian. They are about like all the other South Americans. Some of them claim to be pure Spaniards, and from that they are everything down to pure Indian. They have the characteristics of the ordinary Spanish-Americans, being inclined to revolutions and so on; but the main body of the population is a very sturdy Indian people. I think they are very much stronger, more reliable, better men, than the mixed.

Senator HAWLEY. Well-behaved?

Dr. BRANSFORD. They are, sir; as far as my experience goes. They are very steady and good workers. When we wanted good, reliable men for work we always tried to get the pure Indians.

MR. TREAT, A CONTRACTOR, TESTIFIES.

Mr. Treat, a contractor who built nearly 10 miles of railroad for the Maritime Canal Company, from Greytown west, made the following statements:

Mr. TREAT. It was a peculiar contract. I took it for the purpose of studying the questions of labor and climate and health and supplies, having in view a large contract on the canal, and I said if they would give me control of the whole thing, and not let the engineers interfere with me too much, and would furnish what I wanted from New York, I would build the railroad for 10 per cent of what I paid out for labor in the country, I paying my own office force and superintendent of construction. I commenced the work about the last of May, 1890, and finished my work about the last of December, 1890—I believe it was 1890.

The CHAIRMAN. What length of road did you build?

Mr. TREAT. Nearly 10 miles—perhaps a little less than 10 miles.

Senator HANNA. Standard gauge?

Mr. TREAT. Standard gauge.

The CHAIRMAN. Describe the point you started from and where you went.

Mr. TREAT. I started from the Greytown Harbor—that is, the lagoon—and went south of the canal line as located—parallel to it, perhaps a thousand feet away from it—directly to the westward, parallel with the canal line all the way.

The CHAIRMAN. Did you build out to the Deseado River, or stream?

Mr. TREAT. I think I crossed that; I am not sure.

The CHAIRMAN. What sort of a country was it that you went through?

Mr. TREAT. It was almost perfectly flat, you might say, covered with forests, the first 8 or 9 miles covered with water—completely covered with water.

Senator HANNA. How deep?

Mr. TREAT. From a foot up to over a man's head.

The CHAIRMAN. How did you construct a road through that water?

Mr. TREAT. I cut down trees and built a solid corduroy by laying the logs parallel to each other, perhaps 16 or 18 feet long, until I got above the water, and then I laid rails on top of this causeway of logs and put a steam shovel at work where the entrance was to be for the canal and loaded flat cars there with the excavation. I had two trains of flat cars, 15 cars to a train, and two locomotives, and then I backed these cars out on this track laid on the logs, and used a ballast plow, and in time completely buried this foundation taken from the entrance to the canal. I actually commenced the construction of the canal by taking out about 100,000 cubic yards at that point, and in time of course I buried this substructure completely with sand. Of course, as these logs were covered with sand, the track was raised and the sand tamped under it until a substantial road was built.

The CHAIRMAN. Was it a substantial road?

Mr. TREAT. Oh, yes.

The CHAIRMAN. Now, at what cost per mile was that road built?

Mr. TREAT. The whole cost was about \$30,000 a mile.

The CHAIRMAN. Where did you get your cross-ties?

Mr. TREAT. I got some from the timber alongside the track, and some cypress ties from New Orleans.

The CHAIRMAN. About how many men did you have under you while you were at work there?

Mr. TREAT. Perhaps a couple of hundred at the start, up to the neighborhood of 1,000. I think I had nearly 1,000 after two months and from that up to the end.

The CHAIRMAN. How long did you keep them there?

Mr. TREAT. Seven months.

The CHAIRMAN. State what kind of work they did.

Mr. TREAT. Why, of course a large part of the work was right in these swamps, in water. I cut down the trees and cut them up into lengths, some very large trees, 3 feet in diameter, mostly very heavy timber that would

not float, and the work was to drag these logs through the water; they would so nearly float that 20 to 30 men would tie a rope to a big log and drag it along on the bottom to the place they wanted it and then turn it around on to the line of the railroad, so that the work that these men did was wholly cutting these trees and putting them in place to form a part of the embankment, a foundation for the embankment, and fully half of the men were working in this water ten hours a day.

The CHAIRMAN. Every day?

Mr. TREAT. Yes; every day. Out of seven months we lost only two half days from any reason, and that was on account of cold rains.

The CHAIRMAN. And that is all the time that you lost?

Mr. TREAT. That is all the time that we lost. We did not work on Sunday.

The CHAIRMAN. Well, what was the condition of health of your men?

Mr. TREAT. Why, the first lot of men that we had there from Jamaica were a poor lot, picked up off the streets largely and in poor health, seemed to be half starved. I should say that their general health improved while they were on the work. At the end of the work they went away looking better and feeling better than when they commenced. They had good food, a good dry place to sleep, and when they were sick a good hospital to go to.

MR. MENOCAL.

Mr. Menocal, who has been more in Nicaragua than any other American engineer—in all, more than ten years of time—states as follows in speaking of Panama:

The CHAIRMAN. Do you consider that a healthy country?

Mr. MENOCAL. I do not.

The CHAIRMAN. Do you consider it very unhealthy?

Mr. MENOCAL. Very unhealthy.

The CHAIRMAN. How does it compare with Nicaragua in that respect?

Mr. MENOCAL. I regard Nicaragua as very healthy.

Senator HANNA. How would it be at Nicaragua if you were digging a canal there?

Mr. MENOCAL. We did do some digging in the canal.

Senator HANNA. What I mean to ask is, there has been digging done pretty much the whole length of the Panama Canal, the earth has been turned up by excavations made. Suppose you had corresponding excavations along the Nicaragua route from the valley of the San Juan River and you turned up the soil there, would you have any sickness from it?

Mr. MENOCAL. It is possible there may be some more sickness than they have now, but I can say this: We built 12 miles of railroad, 6 of which was in these swamps, and the men had to work in water from their feet to their necks, and we did not lose a man on account of sickness contracted by reason of the climate or the conditions under which the work was done. We had 1,800 men employed in the building of that railroad and we did dredging there for a distance of about seven-eighths of a mile into the swamps, and the condition of health of the people on board of the dredges was excellent, and those living in the vicinity just the same. I was not ill there myself, nor were the other engineers. We had cleared the timber for about 9 miles from Greytown and about 10 miles on the west side of the lake, and we did not have any illness on that account.

The CHAIRMAN. Is that remark true through the entire line to Brito in regard to health?

Mr. MENOCAL. It is claimed, and I believe, that the more you go west the healthier it is. I would like to call the attention of the committee to one matter, if I am permitted to do so.

The CHAIRMAN. Oh, yes.

Mr. MENOCAL. I refer to one condition in Nicaragua which does not exist in Panama. It is very true that we have swamps back of Greytown extending several miles, but the rainfall is so great that the water in the swamps is renewed constantly. You can drink it at any place. We used to drink it constantly.

Senator HAWLEY. It is not stagnant?

Mr. MENOCAL. It is not stagnant. It is being renewed all the time from the heavy rains, while in Panama in the four or five months of dry season the swamps get dry, and then is when the sickness prevails. That is the time that the country becomes extremely unhealthy. It is not in the rainy season. What I fear is the dry season.

The CHAIRMAN. What effect do the trade winds have in Nicaragua, according to your opinion?

Mr. MENOCAL. The healthy condition of Nicaragua is partly attributable to the trade winds blowing up the valley of the San Juan, and I believe it is correct.

Senator HANNA. Let me ask you, what year did you do this work that you are talking about in Nicaragua?

Mr. MENOCAL. From 1887 to 1892.

MR. JONES TESTIFIES.

Mr. James O. Jones states as follows, speaking of the Nicaragua Canal Commission:

The CHAIRMAN. You were employed under that Commission for eleven months?

Mr. JONES. Yes.

The CHAIRMAN. Were you in Nicaragua all the time?

Mr. JONES. I was in Nicaragua for eleven months, and I was here under the same Commission for about nine months.

The CHAIRMAN. Writing up their report?

Mr. JONES. In the Washington office, working on the precise-level report.

The CHAIRMAN. When you went back a second time, under what authority did you go?

Mr. JONES. I went back in July, 1899, under the Isthmian Canal Commission, headed by Admiral Walker.

The CHAIRMAN. How long did you remain there on that service?

Mr. JONES. I was there from July, 1899, until May, 1901—about twenty-two months.

The CHAIRMAN. What were you engaged in while you were there on that service?

Mr. JONES. I was engaged in the hydrographic work under Mr. Arthur P. Davis.

The CHAIRMAN. Did you stop your work on account of the weather when it was raining?

Mr. JONES. No, sir.

The CHAIRMAN. Here, when you were running the line, or when you were attending to this hydrographic work?

Mr. JONES. The rain did not stop my work at all. I was out in the rain and all kinds of weather while I was engaged in this hydrographic work, and when on the line of precise levels that I speak of was out in the rain all day. Of course, in the hardest showers or when it was raining very hard we could not work.

The CHAIRMAN. You were exposed to it?

Mr. JONES. We were exposed to all of it.

The CHAIRMAN. About how many men were in that precise-levels party?

Mr. JONES. There were six men.

The CHAIRMAN. And you continued at work for eleven months?

Mr. JONES. Yes, sir.

The CHAIRMAN. In the field?

Mr. JONES. Yes, sir.

The CHAIRMAN. What was the state of the health of those men during that time?

Mr. JONES. It was very, very good. They all had very remarkable health for the kind of country that we went through.

The CHAIRMAN. Did they have any sickness?

Mr. JONES. There was no sickness to amount to anything at all. None of the men were laid up.

The CHAIRMAN. During that eleven months?

Mr. JONES. Not to speak of. A man might be laid up a day or two or something of that kind occasionally, but never ill to speak of.

The CHAIRMAN. You were working right along through these ponds and water courses, and so on?

Mr. JONES. For some distance on the river we encountered heavy swamps. We worked right through them; worked in water up to our knees and sometimes up to our shoulders. We set up the instrument in water almost up to the thumbscrews.

The CHAIRMAN. And none of that party were sick to speak of, as I understand you?

Mr. JONES. No; there was no illness at all in the camp to amount to anything.

The CHAIRMAN. About how many men were engaged under Admiral Walker in Nicaragua on the isthmian canal survey?

Mr. JONES. The Nicaragua Canal?

The CHAIRMAN. The Nicaragua Canal survey.

Mr. JONES. Why, there were about seventy. There were sixty-nine men went down on the *Newport* and a few more came, and one or two returned to the States. There were about seventy men in all.

The CHAIRMAN. How long were those men employed on the Isthmus; I mean to say at Nicaragua?

Mr. JONES. Why, I suppose they were there for eight months anyway.

The CHAIRMAN. In the wet season or the dry season?

Mr. JONES. They were there through a period of both.

The CHAIRMAN. Well, did they work right along through these ponds and morasses?

Mr. JONES. Yes; they worked just the same as I did.

The CHAIRMAN. What was the state of the health of that party during the time they were there?

Mr. JONES. It was remarkably good.

The CHAIRMAN. Did any of them die?

Mr. JONES. No, sir; none of them died while the parties were there.

The CHAIRMAN. Were any of them sick?

Mr. JONES. There was some sickness, but nothing to amount to anything at all.

The CHAIRMAN. What kind of water did you drink while you were out there during all this long service?

Mr. JONES. We drank San Juan River water when we got to it, and when we were back away from it we would drink the waters from the small rivers that were tributaries of the San Juan. We would drink any water that we came to, almost; swamp water or anything else.

Gen. Edward P. Alexander testified as follows:

General ALEXANDER. After the civil war I was first professor of engineering and mathematics in the University of South Carolina for four years and then I went to railroading, and I was engaged in railroading generally as manager of roads with engineers doing work under me for some twenty years, more or less. Since then I have been on two governmental commissions, one on the improvement of The Dalles of the Columbia River, The Dalles and Salido Falls in Oregon, and one commission on the connection between the Chesapeake Bay and the Delaware Bay. These were joint commissions of civilians and Army and Navy officers generally. Then for three and a half years I was employed as engineer arbitrator of the boundary survey between Nicaragua and Costa Rica, by those two Governments.

The CHAIRMAN. Where did you reside during the time you were thus employed by Nicaragua and Costa Rica?

General ALEXANDER. My headquarters were generally at Greytown, Nicaragua.

The CHAIRMAN. How did you find the health conditions of Greytown during your residence there.

General ALEXANDER. I found them very good indeed; never lived in a place that had less malaria.

The CHAIRMAN. Is there much population in Greytown?

General ALEXANDER. No; very small; only about 1,400.

The CHAIRMAN. What years were these?

General ALEXANDER. 1897, 1898, 1899, and part of 1900.

The CHAIRMAN. I wish you would describe that country as to its eligibility for civilized people—for white people—its productions, and other matters connected with agriculture. Just give a description of it as you saw it.

General ALEXANDER. It impressed me as one of the most attractive countries that I ever saw for a poor man to make a living in. As I laughingly told the gentleman who was escorting me around, if I had to be born again I would ask the angel that was bringing me down to take me to Nicaragua, if I was to be landed without any money; that I would rather light in Nicaragua than in any other place I knew.

The climate is very pleasant. The agricultural opportunities are limitless. The soil is good, and I do not know a more attractive country than that.

The CHAIRMAN. Do they raise a variety of crops there?

General ALEXANDER. Everything in the world.

The CHAIRMAN. What are the characteristics of the population?

General ALEXANDER. Its population are a good, plain, country people. They seem to be amiable, courteous, and polite, and I do not think they were specially disposed to go into insurrections or rebellions. They are industrious enough at anything—in fact, they are very industrious at anything that they are used to. They would not do much if you put them at a wheelbarrow and a ditch, perhaps, but put them in the woods with a machete or on the river with a paddle and they will do as good a day's work as any man that I ever saw. There are plenty of instances there of men whom I saw who are in very comfortable circumstances, who started out in life with nothing but a machete, who have got little coffee plantations, fruit plantations, etc.

The CHAIRMAN. Does coffee grow abundantly in that country?

General ALEXANDER. Yes.

The CHAIRMAN. Of good quality?

General ALEXANDER. While I was there, in 1889, it was Nicaraguan coffee, raised in the vicinity of Matagalpa, that brought the highest price in London of any coffee sold that year from any part of the world.

The CHAIRMAN. That Matagalpa country is a white settlement, is it not?

General ALEXANDER. Yes.

The CHAIRMAN. A prosperous people?

General ALEXANDER. Yes.

The CHAIRMAN. Are they peaceable and obedient to the laws?

General ALEXANDER. They seem to be so, entirely.

The CHAIRMAN. What do you think of that region of country, including Costa Rica and other parts of Central America that would be accessible commercially to the canal, as a feeder to the canal, the income of it?

General ALEXANDER. I think it ought to be one of the richest tropical countries in the world.

The CHAIRMAN. Capable of sustaining large population?

General ALEXANDER. Yes.

The CHAIRMAN. What would you expect from the health of the people?

General ALEXANDER. There is no trouble about the health anywhere in that country, I think.

The CHAIRMAN. You found it healthy?

General ALEXANDER. I found it so, entirely.

The CHAIRMAN. Did you have as good health there as you had at home in South Carolina?

General ALEXANDER. Entirely so; yes, sir.

Senator MITCHELL. That condition as to health applies to both sides of the divide, does it?

General ALEXANDER. Yes, sir.

Mr. H. H. Trundle, the engineer who surveyed and located the canal for the Nicaragua Canal Commission and also for the Isthmian Canal Commission east from Boca San Carlos to Greytown, testifies as follows:

The CHAIRMAN. Would you think it any more difficult to construct a canal through that portion of Florida where you were than at Greytown?

Mr. TRUNDLE. No; I do not know that it would be any more difficult to construct. I notice one difference, though, that while I was in Florida I employed most of my men to help me there, and none of them would last more than a month or two. They would get sick or something and leave. One that I took down from here was sick there and had to leave, quite sick, and in Nicaragua we had very little sickness either among the natives or the men that we took from the States.

The CHAIRMAN. In the first survey you made for Admiral Walker's commission, or the Nicaraguan Canal Commission, about how many men, officers, and employees of every kind were under your charge?

Mr. TRUNDLE. Well, my party numbered about 6 or 7, and I had about 20 or 30 laborers, depending upon the country that I was going through.

The CHAIRMAN. How long were you engaged in the field there?

Mr. TRUNDLE. I think I was in the field about ten and a half months.

The CHAIRMAN. Ten and a half months consecutively, straight along?

Mr. TRUNDLE. Yes.

The CHAIRMAN. What was the health of your party on that occasion?

Mr. TRUNDLE. I think I had one man at the hospital for a week or ten days, one officer, and then all of us, I think, had a day or two of sickness occasionally. I was sick three times, I think, but not sick enough to leave camp; and I would only stay in camp while I had fever, and then go ahead on the work. Among the laborers there was practically no sickness other than a few machete cuts that caused them a good deal of trouble.

The CHAIRMAN. Did you and your men take the water as it came?

Mr. TRUNDLE. Yes.

The CHAIRMAN. And the swamps as they presented themselves?

Mr. TRUNDLE. Yes.

The CHAIRMAN. And went right through them?

Mr. TRUNDLE. Yes.

The CHAIRMAN. Cutting your way with machetes?

Mr. TRUNDLE. Yes.

The CHAIRMAN. On the second occasion you had a larger party?

Mr. TRUNDLE. Yes; I had four engineer parties, each about the same size as my other party—four engineer parties of about six or seven men, and then each of those parties had from fifteen to twenty-five laborers.

The CHAIRMAN. How long were you in the field with those men?

Mr. TRUNDLE. Very nearly a year; more than eleven months, I think.

The CHAIRMAN. Consecutive work?

Mr. TRUNDLE. Yes.

The CHAIRMAN. Every day?

Mr. TRUNDLE. Yes.

The CHAIRMAN. That was the Isthmian Canal Commission work that you were doing then?

Mr. TRUNDLE. Yes.

The CHAIRMAN. What was the health of your party then?

Mr. TRUNDLE. Well, the health was good. I had one or two men in the hospital two or three times for a few days. One man was quite sick. That is, he had some of the fever that they have down there, and he was pretty sick, but I don't remember how long he was in the hospital. I do not think

he was there over ten days, if as long, and then he went out on the work again.

The CHAIRMAN. That was the only real sick man you had?

Mr. TRUNDLE. That was the sickest I had, and he was at no time dangerously ill.

The CHAIRMAN. What was the general health of your party?

Mr. TRUNDLE. Oh, it was good. It was better than I would expect anywhere that I have ever been in the States where I had as much swamp to contend with.

The CHAIRMAN. Was it as good as the health of your people when you were in Florida?

Mr. TRUNDLE. It was better.

The CHAIRMAN. Did you drink the water of the country as you came to it, or did you have a particular supply of water?

Mr. TRUNDLE. Well, I tried to have the water all boiled for drinking water in the camps, and I thought that I was succeeding pretty well; but since I have gotten back I have found out that I did not succeed quite so well as I thought. I attribute the health largely to the fact that the water was boiled, and I was speaking of it afterwards to some of the men, and they have told me since that they always kept the boiled water but they seldom drank it. I think all of them drank the water pretty much as they came to it. A good many of them used the water vine, and drank water from that.

The CHAIRMAN. There is a vine there that yields water?

Mr. TRUNDLE. Yes.

The CHAIRMAN. Gives about a pint as you cut it?

Mr. TRUNDLE. Yes; you cut off about 3 feet of it.

The CHAIRMAN. What is the health of the natives in that part of the country who were employed by you?

Mr. TRUNDLE. They seemed to be healthy. They never lost much time, other than when they would get a chance to go to Greytown and get drunk, or something like that.

MR. LYMAN E. COOLEY TESTIFIES.

Mr. Lyman E. Cooley, the engineer and constructor of the Chicago Drainage Canal, spent four weeks in the field in Nicaragua while the Nicaragua Canal Commission was at work there in 1899.

In his deposition he makes the following statements:

The CHAIRMAN. As engineer for the contracting company in 1897 and 1898, of which you make mention, did you visit the localities of the Nicaragua and Panama Canal routes?

Mr. COOLEY. We went entirely over the Panama route and examined it in a casual manner. We examined the Nicaragua route with great care on the ground, as much as we could.

The CHAIRMAN. Was it a private enterprise?

Mr. COOLEY. Yes.

The CHAIRMAN. What were you doing down there? What was your purpose in going there?

Mr. COOLEY. A number of gentlemen in New York were interested in the canal proposition financially, and had undertaken to finance the project of an interoceanic canal in case a group of contractors could put a price upon it. We went down there for the purpose of ascertaining whether we could put a price upon it or not.

You are in a wilderness in much of Nicaragua. It is not easy to see things. The physical discomfort in getting around is simply enormous on the eastern division. Fortunately I had the good sense, I congratulate myself on that, to select men who were pioneer men, who had been doing pioneer work, not municipal contractors, but men who had been out against the frontier, and engineers of the same class, who would not be deterred by an unbroken wilderness.

And one of these men remarked, in a very significant way, that if the country was cleared up, if there were roads where men could ride about with a buggy and get around comfortably, and if there were good hotels at convenient intervals, it would make every difference in the world in a man's mental attitude. You may look for the average man who undertakes to examine these routes to be in favor of Panama for that reason. I did not discover anything in Nicaragua that was equal to an Arkansas canebrake in the St. Francis bottoms. I did not discover anything in the way of a forest that was equal to a Wisconsin forest. I did not discover anything in the way of insects that was equal to experiences I have had on the Missouri River bottoms in the State of Nebraska.

We looked particularly into the health conditions, and I am just as confident of the health conditions in Nicaragua as I am along the Gulf coast of the United States; and I am not as confident of the health conditions at Panama.

I believe that those conditions, the mere difference on that one thing of

comparative health alone, will make the difference between a profit and a loss to a syndicate that undertakes to build these works. I believe, further, that if you will take the \$40,000,000 with which it is proposed to buy the situation at Panama, and spend that sum judiciously in Nicaragua, and then recall this same Commission, there will not be a question of doubt as to the superiority of the Nicaragua route in the mind of any man who has signed this last report. That is my best judgment, and I am very firm in that conclusion.

The CHAIRMAN. I wish now, Mr. Cooley, to get your views on the commercial and military advantages of the Nicaragua route as compared with the Panama route, for the benefit of the United States Government and the people of the United States, and I will begin by asking you first as to the possibility of a local development of production and concentration of population on the Nicaragua route; and the basis of that would be, first, the temperature of the country and its healthfulness. I ask you now, if you please, to describe that country with reference to this matter.

Mr. COOLEY. I looked into that phase of it for the reason that, as a commercial enterprise, which was then proposed, the question of what assets could be created by a corporation building the canal there was a very material question as to its profits, and whether it was justified in undertaking the scheme at all or not.

Nicaragua lies practically in the same latitude north as Java or the East Indies lie in the south. It has every variety of climate, from the lowlands, where they produce indigo and cocoa and various fiber plants and fruits, clear up to the frost line.

The CHAIRMAN. Rubber?

Mr. COOLEY. Rubber trees, yes; and at an altitude of 1,200 to 1,500 feet you strike the coffee belt, extending to the frost line, and up at the frost line and above you can raise the northern cereals and vegetables. At a market in San Jose I saw a collection of kitchen truck raised in Costa Rica near the frost line in the month of February that would duplicate a northern market garden.

You can select your climate. Nicaragua, Honduras, and Costa Rica, in an area of perhaps 50,000 to 60,000 square miles naturally tributary to the Nicaragua Valley—more than the State of New York, more than the island of Java—has every variety of climate. I mention the island of Java because it is one of the most highly developed spots on earth, carrying a population of 24,000,000 on 47,000 square miles. I believe that Nicaragua has as large a potential, from the Pacific at the Bay of Fonseca through to the Caribbean. Whether the country east of Castillo will be susceptible of much development I do not know. They have developed a good deal on the Rama River, and at Bluefields and at Limon they have done considerable in the way of producing bananas. The bananas of the United States coming into New Orleans come largely from Bluefields, and the bananas going to New York come largely from Limon, Costa Rica, and in the interior you can produce everything that a tropical country produces.

As to the health conditions, I made diligent inquiry, on the western division, of Dr. Flint, a man over 80 years old, at Rivas, who has lived in the country since 1848 as a practicing physician, and of Dr. Cole, who has been there since 1854, at Rivas. I could not learn that they had any diseases which we need be apprehensive about, especially on the western division, and that it was immune, you might say, from such things as kidney troubles and rheumatism.

The CHAIRMAN. Pneumonia?

Mr. COOLEY. No; they have pneumonia everywhere on earth. Tuberculosis is not in the country, I believe. I asked Dr. Flint, after I had gone over the entire catalogue, what the people really did die of, because it was evident that they died. He said that the majority of the death rate in this country is due to lack of proper nutrition and to dissipation.

On the Atlantic side we had Dr. Soto, who accompanied our party as physician to see that none of us got into ill health, and we got from him the statistics of what little experience they had had at Greytown with the force that they worked there when he was the company's physician. He asserted that there had never been a case of yellow fever at Greytown, unless it was sporadic, and had been brought there. There had been only four cases that he knew of as a matter of fact, and that the so-called yellow fever, jungle fever, spotted fever, or whatever you call them, which all belong to the meningitis type, were not virulent. That was also the testimony of Dr. Flint and Dr. Cole.

A year later a physician came to my place in Chicago and wanted to go somewhere in the Tropics. There were four of them in the party bent on new experiences and scientific collections, and I advised Nicaragua, and asked that they investigate especially the health condition there.

One of these gentlemen turned up in my office three or four months ago. He had spent four months in Nicaragua, and as a physician he had inquired diligently. He had spent part of his time in the Silico lagoon country down around Greytown hunting alligators and collecting specimens for museums.

He said he had absolutely no trouble, and he finally summed up the situation as his personal opinion that no man need die in Nicaragua except of old age, if he will take care of himself.

Now, the evidence of our own party was that we took 15 men across the Isthmus. It was a question whether we should make special provision and take special precaution about the water and things of that kind. Mr. Mason very sensibly remarked that if we ever did business in that country we would have to drink the water that was in the country, and he was going to drink it all. So we all did the same. We drank all the water we came to, from one side of the Isthmus to the other.

The CHAIRMAN. Took it as you came to it?

Mr. COOLEY. Oh, yes. There were some streams that we avoided, of course, used our horse sense about, just as we would in the United States. And there was no man in our party who suffered from it. On the Pacific side we rode horses and some of us had not been on horseback for years. Some were men of age, and we went right out there for four days and camped on the ground, and slept out nights. On the Atlantic side we walked under very great fatigue and camped out every night, and no man was inconvenienced, although the fatigue was as great as you could experience under any conditions in the United States.

None of us experienced any inconvenience except Mr. Stephens, who ought not to have taken that trip, because he was a man nearly 60 years of age, and he got very much exhausted, tired out, and when he got up to San Jose, Costa Rica, he had a little touch of intermittent fever that lasted him a week and was very light. That was the only experience of that kind we had. And I feel confident that if we had stopped at Greytown a couple of days longer and rested, he would not have come down with it.

The CHAIRMAN. Is that a good fruit country?

Mr. COOLEY. I was shown an orange tree at Greytown from which they had picked 200 boxes of fruit the previous year.

The CHAIRMAN. Two hundred boxes?

Mr. COOLEY. Yes.

The CHAIRMAN. About how many in a box?

Mr. COOLEY. I don't know how many. There are about 125 in the ordinary shipping box. That was told to me by the consul at that point. At Castillo I picked limes off of trees that were loaded.

On the Pacific side the oranges were growing wild. There was no market for them. The citrus fruits, I think, grow well all the way across.

The CHAIRMAN. And cocoa?

Mr. COOLEY. Yes; that is the chocolate bean. Manier, the French chocolate man, whose brand you buy all over the country, has his plantations near Rivas.

The CHAIRMAN. Is it an attractive country in its topography and scenery?

Mr. COOLEY. The shores of Lake Nicaragua are beautiful as a dream. Lake Nicaragua is about half as big as Lake Ontario. If I was leading the ideal life which some people are striving for I should spend six months of the year on Lake Nicaragua, or in that valley there after this canal was opened.

I feel a kind of indignation when I hear people talk flippantly about this health question. I remember that the army, the crack service of the United States, with selected lives, were not able to do as well in Cuba or as well at Chattanooga, right in our own country, as we did on the Chicago Drainage Canal with 8,000 hoboes picked up from all creation. There we had as good a condition of health as in the best wards of Chicago. The health question was one that I went into deeply, and I think I can say justly that through my initiative in that matter and through the cooperation of the State board of health of Illinois that for the first time in the history of great public works we produced an ideal condition of health.

The CHAIRMAN. Ometepe, which is a little island filled with volcanoes that I think are extinct, in Lake Nicaragua, is referred to by some medical authorities as being a very excellent site for hospitals and for sanitariums.

Mr. COOLEY. I think it undoubtedly would be.

The CHAIRMAN. For navigators and sailors?

Mr. COOLEY. I think it undoubtedly would be ideal; anywhere on that western division is a fine country. Up there on the Brito headland, nearly 400 feet above the sea, is an outlook that is magnificent.

The CHAIRMAN. I believe that used to be a place of resort for the coast people?

Mr. COOLEY. Yes; so I understand. I think anywhere around there the health conditions are excellent.

MR. SORSBY AND MR. DONALDSON, OUR CONSULS IN NICARAGUA, TESTIFY.

If we take the picture of Panama as drawn by Capt. Bedfore Pim, Baron Humboldt, and the Panama Canal Commission, and set it beside that drawn by General Alexander and Mr. Cooley, and by Consuls Sorsby and Donaldson, and if we could resolve

every question in favor of Panama, except that of health, humanity would forbid us from pricing that priceless blessing at \$5,630,704 and choosing a country always subject to the ravages of sickness for the use of millions of people in preference to a beautiful and healthful canal route through Nicaragua. Consul Donaldson has resided at Managua, in Nicaragua, since 1895. He went there with the Ludlow Commission as an engineer.

These depositions were taken in June, 1900. They are of great importance and can not be abbreviated so as to present a correct view of the facts stated in them. A few facts from each will show their knowledge of the healthfulness of Nicaragua. Mr. Donaldson says:

Q. I suppose you travels with the engineering parties you accompanied through the San Juan region have given you an opportunity to be stricken with any of the diseases of that country?

A. Yes; I have had plenty of opportunities. I have slept in all sorts of places.

Q. Slept in wet clothes?

A. I will not say I slept in wet clothes, because I always carried a bundle wrapped in rubber, so that I could have something dry to wear for the night. I have gone all day in wet clothes, have put on wet clothes in the morning, and have done so for months at a time; but at night I have always had dry pajamas to get into and a dry blanket, which I kept rolled up in a rubber sack.

Q. That was during your engineering work?

A. Yes.

Q. Were any of your party troubled with malaria or chills?

A. Nobody in our party had any sickness at all. We had 10 Americans in the party, besides natives.

Q. Taking Nicaragua from ocean to ocean, would you be willing to say that it is a healthful or an unhealthful country?

A. I should say that the country is perfectly healthful. The only unhealthful places are the cities, and that is owing to their filthy conditions.

Q. You have a family of children?

A. I have three children.

Q. And they have been brought up in that country?

A. They have been in better health in that country than when they were in New York. My youngest little girl in this country had a bronchial trouble after she had had the whooping cough in New York at the age of 3, and naturally I felt somewhat anxious about taking her to Nicaragua. But she has come back to New York and is to-day one of the strongest little girls you ever saw—at the age of 8 now.

Q. Taking Nicaragua from ocean to ocean, through and through, you would say, I suppose, that it would be a very valuable country in the hands of people who had any industry and thrift?

A. Yes. By nature it is a rich country and perfectly healthful. There is nothing under the sun they need there but industry. It would make a fine country to live in.

Q. For small farmers, particularly?

A. Yes. You can get a splendid climate there by going up 2,000 feet, where you would not suffer from heat at all. It is only in the low country where you suffer. I have suffered much more in New York from heat than I ever have in Managua. There is nothing the matter with the country; there is nothing the matter with the climate; the whole difficulty lies with the people. They are too easy-going; they take life very easily.

Mr. Sorsby, who has resided at Greytown since 1898, says:

Senator MORGAN. Are the lands in the valley of the San Juan River valuable—I mean for agricultural purposes and timber?

Mr. SORSBY. They are, beginning at about 6 or 7 miles up the river from Greytown.

Senator MORGAN. And extending up to the lake?

Mr. SORSBY. Yes, sir; except immediately on the bank above Castillo.

Senator MORGAN. If a ship canal were constructed through that country would it add to the value of those lands?

Mr. SORSBY. It would add enormously to the value of the lands from about that distance up.

Senator MORGAN. What are the chief agricultural and horticultural productions of that country?

Mr. SORSBY. The chief production at present on the river is cacao, and there is a great deal of rubber brought out from there. There are several

rubber plantations planted there. There are several cattle ranches along the river. There are some bananas planted; not much, though it is considered excellent for bananas. There is none grown there now, because of the difficulty of handling them, of shipping over the bar. The woods, the timbers, higher up the river are considered fine and good.

Senator MORGAN. What kind of timber is it?

Mr. SORSBY. I have seen various kind of hard wood.

Senator MORGAN. Mahogany?

Mr. SORSBY. No, sir; I have not seen any mahogany there. Up the river, near the lake, there is quite a lot of cedar, red cedar, and several varieties of cedar. There are various kinds of hard woods in there that I do not know the names of.

Senator MORGAN. Is it a coffee country?

Mr. SORSBY. No, sir. Between the lake and Greytown and near the line of the proposed canal, or near the line of the river, it is not considered a coffee country. The elevation is too low.

Senator MORGAN. Is it a sugar country?

Mr. SORSBY. Yes, sir; I think the soil and climate admirable for the cultivation of sugar cane.

Senator MORGAN. Rice?

Mr. SORSBY. Yes, sir; sugar, rice, fruits, and vegetables of all kinds.

Senator MORGAN. Indian corn?

Mr. SORSBY. I doubt that Indian corn would grow very well in any part of the country.

Senator MORGAN. Is it a good cattle country?

Mr. SORSBY. Yes, sir; a good cattle country.

Senator MORGAN. Does it appear to be a well-watered country?

Mr. SORSBY. Yes, sir.

Senator MORGAN. How about the health of that region between the lake and the seaboard?

Mr. SORSBY. I can only answer that by referring to the men employed by the Nicaragua Canal Commission.

Senator MORGAN. Have no people settled in that region?

Mr. SORSBY. There are some settlements immediately on the river banks and up the various rivers emptying into the San Juan River.

Senator MORGAN. Leading into, you mean?

Mr. SORSBY. Leading into the San Juan River. I have seen a great many of those people—some foreigners are in there—living on the San Carlos and various other rivers leading into the San Juan River, and the universal expression is that it is healthy.

Senator MORGAN. Is there any yellow fever or Chagres fever in that country?

Mr. SORSBY. There is no yellow fever in any part of Nicaragua.

Senator MORGAN. Is there any Chagres fever?

Mr. SORSBY. No, sir; nothing that resembles either yellow or Chagres fever on the Atlantic side. There is no yellow fever in any part of Nicaragua, though at Granada and Managua they have malarial fevers. They are quite prevalent during what is known as the dry season up there.

Senator MORGAN. That is on the lake?

Mr. SORSBY. Yes, sir; on the two lakes. It is attributed to the bad sanitary conditions and the water that is used.

Senator MORGAN. If I understand you correctly, the valley of the San Juan River is very sparsely inhabited?

Mr. SORSBY. Yes, sir.

Senator MORGAN. Is the forest heavy?

Mr. SORSBY. The undergrowth is very heavy.

Senator MORGAN. Almost impenetrable?

Mr. SORSBY. Yes, sir.

Senator MORGAN. What is the effect of the rainfall in that part of Nicaragua upon the health and comfort of those living in that region?

Mr. SORSBY. I think it is beneficial to health. It is inconvenient. It has the effect of keeping fresh water in all the lagoons there. The engineers of the canal commission tell me that they drank their water out of the lagoons and streams, and it was good. In Greytown it serves to freshen the atmosphere, and there is very little sickness during the rainy system.

Senator MORGAN. I gather from your statement, then, that the rainfall there would neither be deleterious to the health of the country nor to the construction or preservation of such a work as a canal with embankments?

Mr. SORSBY. It certainly would not affect the preservation, judging from the indication shown by the work that has been done there. It might be inconvenient. Constant rainfall would naturally be inconvenient to a day laborer. It is considered there that that is the healthiest part of the year in Greytown and vicinity.

I thought these features of the case of sufficient importance to require that the facts should be presented in some detail.

Under the health conditions as they are and will remain it seems impossible that the United States can furnish the money and take the risk of the sacrifice of lives that are necessary to purchase and complete the canal at Panama.

POLICE POWERS NECESSARY IN SANITATION.

Connected with the health conditions at Panama, in such a way that it is inseparable, is the question of police jurisdiction and control of the bays of Colon and Panama, and of these cities. A joint control of these places is indispensable to sanitation and the preservation of the peace.

A mixed or joint control is incongruous, irritating, and dangerous. In fact, it is utterly inadmissible.

The city of Panama is the capital of a State of Panama, and lies within less than 3 miles of the Panama Canal; and the Panama Railroad enters the city.

It can not be reasonably expected that the powers of local government vested in that State and necessary for the control of its capital city, whatever they may be, will be yielded to the United States in whole or in part; or, if that should occur, that we could expect to use them with such vigor and so exclusively as is necessary in sanitation and quarantine.

In all our efforts to repress the contagion of yellow fever the highest powers of government, both State and Federal, have been necessarily resorted to, and even these have been frequently ineffectual to prevent bands of private persons from armed interference with the regulations established by law.

Personal liberty, in its most personal and individual sense, is always involved in the execution of health regulations, and such occasions require the exertion of the most direct and arbitrary authority, backed by force in frequent instances.

It will be in vain that we will hope to control or suppress yellow fever or the bubonic plague, cholera, beri-beri, or leprosy, to all of which Panama is at all times exposed, when either Panama or Colombia is to be allowed a voice in the regulations we must adopt, or in the selection and control of the men who are to enforce them. It is sheer folly to undertake such a conflict as is required to suppress yellow fever with forces divided and alien to each other, in the midst of a mixed throng of low-grade people.

The control of the trade and intercourse between Colon and Panama, the State capital, and Carthagena, the commercial capital, and Bogota, the political capital of Colombia, by the concessionaires of a canal, except by force or by some special agreement, is impossible. The people of those places will not tolerate sanitary regulations that will prevent their free intercourse. The importance of this exclusive control of sanitation is greatly magnified when we attempt to apply the necessary regulations, at all times and without relaxation, as they must be applied to the occupants of Panama City and to the intercourse of the people of all nations through this highway of the world.

If the regulations are not of absolute authority and strictly and continually enforced, the canal will become an artery for the dissemination of diseases through the world.

WHY WE ARE AGAIN IN PANAMA WITH WAR SHIPS.

In 1846 we entered into a treaty agreement with New Granada—now Colombia—to guarantee the sovereignty of that Republic over the State of Panama. The consideration for this agree-

ment, as it was expressed in the treaty, was of little value as compared with the burden of this engagement, which has proven to be serious and is now a source of expense, anxiety, and trouble to us. The real consideration was that our duty of protection was exclusive and carried with it the right to admit or refuse other nations to assume a like close relation with Colombia. This became manifest when Great Britain and France, on the suggestion of Colombia, sought to share with the United States these burdens and obligations, which we refused; and so the matter stands to-day.

In 1846 Colombia had a single purpose in making that treaty, which was, with our assistance, to hold the State of Panama subject to her sovereign dominion. The same cause exists to-day, and the danger against which Colombia was providing is greater than it was in 1846, and for stronger reasons. The cause is that Panama has always been averse to the union with Colombia, preferring independence or a union with the other isthmian States. They have no patriotic sentiment and no identity of business relations to support the union with the continental States of Colombia. Constant jealousy has, on four occasions, broken out into open wars of insurrection since 1846.

There have been and are still internecine wars, and are all political in character. Holding Panama in the leash bound to Colombia, as we have been compelled to do and are now doing, we incur the natural resentment of those people, nearly all of whose possessions of any real value are at the canal terminals or near to its line.

AN UNFRIENDLY PEOPLE IN PANAMA.

If we acquire control of those people, along with the bays, the cities, the railroad, and the canal, we will encounter the serious difficulty of using and operating them among an unfriendly people.

Power alone can not be relied upon to protect a canal under such conditions, and the task is full of dangers, especially where the country is already occupied by insubordinate and revolutionary elements. We may get along without it, but the experiment is very costly at the price of \$5,630,704, with an additional stipend to be paid to Colombia. Panama must be paid at least the \$25,000 per annum, secured to her in the railroad concession, for more than sixty years to come, or for all time, if the lease is to be made perpetual, because she holds that right against the railroad company under and as part of the concession of Colombia to the Panama Railroad, which has been enacted as a public statute by the Colombian Congress.

When Panama shall hereafter seek to increase her allowance as the price of peace and good conduct toward the canal, as she certainly will, we will naturally expect trouble.

THERE IS NO ADVERSE CONDITION IN NICARAGUA OR COSTA RICA.

These political, sanitary, police, and social conditions are quite the reverse on the Nicaragua route. There we have no natural causes of epidemic diseases to remove, and yellow fever has never been a visitor to the region in which the canal is located. It is a salubrious country, constantly fanned by the trade winds, with a temperature that varies only 30 degrees, between 56 and 96 Fahrenheit, with a lake system, 45 miles across and 140 miles long, in the center of the land, over which these winds move without obstruction.

The island of Ometepe, in Lake Nicaragua, has been selected by

the common judgment of travelers as a sanitarium for seamen who will pass it on their long and weary voyages. The beautiful country is a place of refreshment for all voyagers, abounding in excellent fruits and supplies of fresh foods. The lake can be conveniently utilized for the repairs of vessels, even to the cleansing of the bottoms from the accumulation of sea grasses and barnacles that lower their speed while they are en voyage passing through its fresh waters.

But a much greater advantage as to sanitation and police is the fact that this fertile country is practically unoccupied, and, under our control, the future occupants will be subject to our selection. Bad characters can not congregate in the canal belt or in the ports, if we object. In Panama this vital question is one of expulsion. In Nicaragua it is a question of our permission. The difference is wide enough and sufficiently important to make it fundamental in the choice of a canal route.

At Panama it is a question of purging out the bad characters found in a low-grade population of 30,000 in a district of 35 miles.

At Nicaragua the question is whether we will tolerate bad men, or demoralizing occupations, in the building up of the cities, towns, and farms in the canal belt, which has not more than 2,000 inhabitants in a distance of 183 miles.

There is no economic question connected with the future management of the canal of more importance than that of peopling the canal belt and the terminal cities with proper occupants.

I am only touching the outline of all these vital questions, leaving the further and better discussions of their merits to others.

THE POLITICAL COOPERATION OF THREE REPUBLICS.

It is a political situation of great moment, and it is a cause of sincere gratification to the three Republics concerned in this canal that their interests are unified and not discordant, as the interests of the State of Panama are toward those of Colombia.

Nicaragua, Costa Rica, and the United States, if they unite in establishing this canal by agreement, are not seeking profits from its earnings, but from the general prosperity it will bring to the Governments and the people of the three Republics. No local dissension can arise in either Republic to question its sovereign power to enter into or to keep the compact, such as may arise in Panama.

The maintainance, safety, and prosperity of the canal is so identified with the growth and solidarity of Costa Rica and Nicaragua, from which it is inseparable, that they will gladly contribute all their governmental and moral power to its support and protection. They will both be jealous for the safety and prosperity of the canal, with no cause for jealousy toward each other as to ownership or control, and the United States will be bound to both in every bond of regard and sympathy and by the great and overruling necessity of shortening the distance between all our Eastern ports on the Great Lakes, the Atlantic and the Gulf of Mexico, and our ports and possessions along the coast and in the islands of the Pacific Ocean.

There seems to be no room for disagreement in future, when our mutual interests are common to each Republic, and are entirely separated from competition with each other. Such accord and concurrence in the establishment of this great benefaction to

mankind is a new and splendid proof of the unity and harmony of principle that exists in the spirit and purpose of republican government.

TRANSPORTATION IN SAILING SHIPS.

A greater question than any I have tried to present, so far as it affects the commerce of the United States and the prosperity of those who create commerce by production, manufactures, and transportation, is directly presented in the proposition to purchase and complete the Panama Canal.

That question is, whether vessels propelled by sail will be driven from the ocean trade and ultimately from existence, by vessels propelled by steam. This prediction is urged by the Panamists as an inevitable fact. It is a prophecy of evil to mankind, which Congress is asked to assist in fulfilling speedily. If it is a prophecy like that which chained the blinded Sampson to the pillars of the temple, the result will be equally destructive to all.

It is a disturbing thought and a distressing forecast, that the alleged rapid progress of civilization, through commercial expansion, requires that we should discard the ocean winds that have built up commerce from its cradle.

It is neither commercial wisdom nor common sense that would cause the world to dispense with this incalculable power of the ocean winds in propelling vessels, that is the free gift of the Creator, and is always ready for use, to take up steam as the motive power of ships of commerce only for the reason that time is saved in making voyages.

The saying that "time is money," which alone accounts for this attempted destructive revolution in commercial economics, means that money and credit are to supplant the benevolence of the All-wise Creator in conferring this blessing upon all the generations of men.

That condition has not been reached and we will not witness the day of its arrival. Our effort to hasten it will fail. May God protect the people of the United States and of the world against that day.

I have less dread of its realization because the prophets of this evil are driven to this course of reasoning by the weight of the fact that the calm belt off the bay of Panama is impracticable for the profitable employment of sailing vessels. It is an absurd theory, adopted as the only escape from a fatal dilemma. If "the wish is not father to the thought," the thought at least is not disturbing to the advocates of the Panama route. They accept it as a decree of fate, with philosophic indifference to the result. They openly avow that the Panama Canal is to be completed without any reference whatever to the interests or advantages of the owners and navigators of sailing vessels or any losses they may sustain through the assistance of Congress to increase competitive advantages of vessels propelled by steam.

THE ISSUE IS SQUARELY MADE AND THIS CONGRESS WILL DECIDE IT ON THIS BILL.

No more reckless an attitude was ever taken with reference to an economic question, or with less benevolence, reason, or justice to support it. But by confession of the advocates of the Panama route, boldly stated, and by the pressure of facts that can not be controverted or avoided the issue is squarely made and must be met.

Since the era in which Job spoke of those "that go down to the sea in ships," the winds have been as necessary to sea travel and commerce as the rains have been to the productions of the soil, and it is as likely that men and animals will abandon the brooks and springs and take to hot drinks as it is that steam will supplant the winds in the movement of ships.

Steam represents the mechanical force of expansion, caused by heat operating upon water, while the winds represent that force, combined with the force of gravitation, operating upon the air, a highly elastic agent. Through these qualities the winds transport themselves to the places where they are needed for commerce, by the action of natural laws, and they are unfailing in supply and in volume and power. They are almost, if not quite as certain as "the stars in their courses," and require no preparation of human labor or skill to prepare them for their work, or to marshal them in their constant array to answer the calls of the Master, who directs the breezes and rules and guides the tempests.

The winds are not dug from the deep mines under the mountains and transported on railroads to the seaboard as coals are, and they require no human help to cross the seas to some coaling station, again to be handled and transferred to coal bunkers, and again handled in furnace rooms of ships under the severest exactions upon human health and strength. The winds, once used, return to the places where they were found, awaiting the service of man, with all their vigor and elastic force. But coals, when once they are used to generate power, disappear and can not be recreated. They create a vacuum in earth and air that they can not restore.

Comparing these forces, a child should understand the imperishable nature and value of the winds, and be able to contrast them with the perishable forces generated from coal, which consume themselves in the use. If the winds did not come to the aid of coal, to transport it to the points where it is to be used in steamships, the percentage consumed in this transportation, like an eating cancer, would soon destroy the body that supports it.

Africa, South America, the Pacific coasts of Russia and North America, and the vast area of southern Asia are so scantily supplied with coal that the commerce of those regions could not be transported by the power of steam that they could supply during a period of even a half century. The rapid-transit commerce of those regions, which only includes such commodities as can bear the burden of heavy freight rates, is transported in steamers that burn coals from Germany, the United Kingdom, Australia, and the United States. The coal supply of the Eastern Hemisphere begins to fall away, and all Europe, including Germany and Great Britain, are beginning to import coals from America.

That fact strikes the vain notion dead, that steamships will ever drive sailing ships from the oceans. This fact is exemplified in the lists of steamships and sailing ships built in the United States in 1901, which I will append to my remarks.

On the contrary, the cost of steam transportation, as it affects commerce in the coarser and cheaper articles of traffic, is so burdensome to countries that have scant supplies of coal that France is granting heavy subsidies to sailing vessels, with the effect of a rapid growth of such tonnage under her flag within

the past five years, and Norway-Sweden is rapidly increasing her merchant sailing fleet.

THE INCREASE OF STEAMSHIPS.

After the opening of the Suez Canal in 1871 there was a rapid increase in the number and tonnage of steamships for ocean service, in which Great Britain led all other countries and began by pouring subsidies into their coffers.

This movement was in pursuance of a great and necessary national policy of Great Britain far more than as a result of any legitimate commercial demand for rapid or cheap transportation. Great Britain had her Pacific possessions to guard and care for. She had Egypt and South Africa to look after, and the trade of India to continue to hold in the grasp of monopoly. She had Russia to exclude from the Mediterranean, and France, Italy, Germany, Spain, and Portugal to compete with for the traffic of the Orient.

There were no winds in the Red Sea to move sailing ships, and there were dangerous winds in the Indian Ocean and fitful winds in the Mediterranean that rendered sailing ships useless on the Suez Canal route. She purchased the stock of the Khedive in the canal en bloc, and, while it was not the majority of the stock of the canal company, it enabled her to put her directors in that company, which she did. And by repressive influences of a diplomatic sort she strangled the possible competition of an American isthmian waterway, while she was reaping great profits from her Suez Canal stock and was forcing new channels of trade through the Pacific Ocean.

It was not that she abandoned her long-settled policy of building sailing ships as the burden bearers of commerce, but because she needed more steamships for emergent service to work the Suez Canal and to maintain her supremacy on the sea.

The proof of this is clear when the rapid and great increase of sailing-ship tonnage to Australia and around the Cape of Good Hope is considered.

In 1884 vessels aggregating 1,565,649 tons entered and cleared at the Cape of Good Hope. In the year 1898 this tonnage amounted to 5,602,955, a fivefold increase in fourteen years. The proportion of sailing ships in this increased tonnage was greater than it was before the Suez Canal was opened. It was the Suez Canal fleet of steamers that she so rapidly increased with the stimulus of subsidies, while her sailing ships increased without such aids.

AMERICAN VESSELS AND THEIR TONNAGE.

On page 1146 of the Hearings Professor Johnson gives the tonnage of registered American vessels as follows:

Steamers, 1,183,000 tons; sailing vessels, 1,360,000 tons, showing an excess of 177,000 tons in favor of sailing ships. Having reached this safe equilibrium, the sailing-ship construction is resuming its activity and is steadily growing. It does not grow so rapidly as steamships in tonnage, but more rapidly in the number of vessels.

Ships enrolled for the coastwise trade are not included in the above statement, and the professor states that three-fifths of the coastwise trade is conducted in sailing ships.

It is needless to speculate how or why these conditions have

occurred. They are actual and existing conditions, established by actual computations in figures. They certainly do not justify adverse prophecies as to their ultimate disappearance.

The proposition to create a canal by drawing on the treasury of the people, and to locate it where sailing ships can not use it, because of the calm belt into which its Pacific terminus opens, thereby depriving more than half the tonnage of the United States of all advantage from it, is simply monstrous, when taken by itself.

It is grievously unjust when it drives sailing ships, built on either coast, from access to the other, even around Cape Horn, in profitable voyages, by giving to steamships the advantage of more than 10,000 miles in distance in passing to and from the North Atlantic and North Pacific, and by shutting them off from such opportunity it is unjust to all commercial men and to all producers and manufacturers by destroying more than one-half the competition between water transportation and railroad transportation on commodities that find their interchangeable markets on our sea coasts, lake shores, and gulf coasts from Sitka around to Duluth.

It is ruinous to individual enterprise in the building, owning, and navigating sailing ships, by turning over the whole business of ocean transportation to the owners of costly steamer lines, and putting the commercial dominion of the seas in the hands of corporate trusts, and of the combines of the sceptered masters of finance and credit who are called capitalists.

There is no American need of such exclusive privileges, and it is sheer spoliation to tax the people to the extent of \$180,000,000 in this generation to construct the canal and in all coming generations to make them pay tolls on their productions to support such privileged classes, while they will gather harvests of gold from their labors.

I pass by the contracts of the Panama Railroad with other lines of transports now existing and have in the recent past extorted hundreds of millions of dollars from producers, chiefly from the people of the Pacific slope, to which agreements the United States will become a party when it buys the Panama Railroad, with the consent of New York. As compared with the destruction of our sailing ships that we would surely visit upon them in purchasing and completing the Panama Canal, this is even a smaller matter than the inheritance of the Panama scandals, which will stink in the nostrils of all men who live and all who shall follow us.

When the era of destruction has overtaken the sailing ships, which is so flippantly predicted by our economic soothsayers, then, also, will come the era of lockouts and strikes in the coal mines of the leading producers of "sea power," and commerce will be brought to a standstill, a dead center, in all the seaports of the world. Labor may then have its dire revenge upon capital, unless armies are interposed to compel miners to work, to produce coal to propel the ships of war and commerce.

I can think of no more helpless state in which the world's commerce would be found than the realization of these dreams of our learned pundits, who so confidently and with such a smiling air of hope look forward to the abolishment of sailing ships as inconvenient tools of trade.

I would then be hopeless of relief through even the magical skill of the associated peace arbitrators, who now promise a great

remedy for a very slight attack of this annual visitation of lock-outs and strikes. If the world is to be destroyed by fire in the end of all things, I would dread the destruction of the sailing ship by the fires of the steamers as the beginning of the end.

THE VALUE OF A DAY IN THE VOYAGE BETWEEN OUR ATLANTIC AND PACIFIC COASTS.

If steamers are so essential to the speed of commercial intercourse, or if the emergencies of war demand the shortest line and the quickest voyage for our armed fleets for their rapid concentration, the advantage of a day may be vital to the country in the one case or to the merchant in the other. And the cost of even a day's voyage, when applied to 1,000 ships through an indefinite reach of time, will be a loss of incalculable sums to the persons or the government that owns the ships.

Ascertained facts, as to which there is no real controversy, demonstrate the assertion that on a round trip between ports of the North Atlantic and the North Pacific oceans there is an actual loss of not less than three days, or seventy-two hours, between the voyages of steamers that will pass through a canal at Panama as compared with the same steamers on voyages to and from the same ports passing through the canal at Nicaragua.

This is a vital point in the economic question involved in the choice of routes, and it is due to its importance that it should be established in a satisfactory manner.

If we will strain our thoughts up to the conception of the actual loss of time and money that will fall upon the owners of steam vessels that will pass through an isthmian canal in a hundred years, which is the shortest period for any proposed lease of canal privileges, and if we will add to it the loss that will fall upon the owners of cargoes, we will find that the route which is shortest by three days would be the cheapest to the American people if it cost \$500,000,000 more than the longer route, and that \$5,630,704 saved in the proposed bargain would not pay the interest on that sum for a single year.

Sailing ships, in this connection, being entirely excluded from consideration, the sailing distances for steamers between the same terminals of a voyage through the respective routes and the speed of the same vessels, as it is effected by the tides on each coast and the length and the curvature of each canal, and the advantages of speed derived from a voyage through fresh water, are the factors that decide this important economic question.

THE VOYAGE OF THE OREGON.

These points are conclusively established by the testimony in favor of the Nicaraguan route. The dimensions of the ship selected by the witnesses for the test is 5,000 tons' burden, and the normal rate of speed is 10 knots an hour, or 250 miles per day. The distance, computed between Key West, which is an average central point on the Atlantic and Gulf coast, and San Francisco, our chief mart of trade on the Pacific, is shown in the following official statement of the Navy Department as to the voyage of the *Oregon* during the war with Spain. This distance is 3,665 knots by the Nicaragua route, measured by the shortest practicable line of navigation, and 3,750 knots measured by "a route that avoids all shoal water and is absolutely safe for navigating battle ships."

By the Panama route the distance is 4,363 knots, and the dif-

ference in distance is 613 knots in favor of Nicaragua by the route that is absolutely safe for battle ships, and 965 knots by a route that is practicable for battle ships and must be entirely safe for 5,000-ton merchant steamers.

But the supreme need for the canal being governmental, in case of national emergency, the distance of 613 knots to the credit of the Nicaragua route is adopted for the further basis of computation as to the saving of distance, time, and money by that route.

The voyage of the *Oregon*, as it is stated by the Navy Department, with reference to time, distance, and the cost to the Government, is as follows:

MEMORANDUM REGARDING THE PASSAGE OF THE OREGON FROM THE ATLANTIC TO THE PACIFIC.

The U. S. S. *Oregon* left San Francisco on March 19, 1898, with 1,567.4 tons of coal on board. Of this coal, 1,127½ tons had been taken on board in San Francisco, at a cost of \$7.95 per ton, and the remaining 439.9 tons had been on board previously, at a cost of \$5.50 per ton, making the total value of coal on board \$11,112.65 and the average value per ton \$7.09.

Coal was received on the trip at Callao, Peru, Sandy Point, Chile, Rio de Janeiro, Brazil, and Barbados, West Indies, and the vessel arrived at Key West with 251.8 tons of the coal originally on board at San Francisco.

In regard to the cost of the trip through either the Nicaraguan or Panama canal, the following distances were furnished by the Hydrographic Office, Navy Department:

	Knots.
San Francisco to Brito (west end of Nicaragua Canal).....	2,700
San Francisco to Key West	965
San Francisco to Panama	3,277
Colon to Key West	1,086

The following table shows the cost of coal for the trip in making the passage to Key West from San Francisco by the Nicaraguan and Panama canals, based on the knots per ton of coal and cost of coal taken on board in San Francisco, which coal would have been enough in either case to make the entire trip:

	Nicaragua Canal.			Panama Canal.		
	Dis- tance.	Coal.	Coal, cost.	Dis- tance.	Coal.	Coal, cost.
San Francisco to end of canal.....	<i>Miles.</i> 2,700	<i>Tons.</i> 651.7	\$4,620.00	<i>Miles.</i> 3,277	<i>Tons.</i> 791	\$5,608.19
Through canal	170	41	290.69	50	12.1	85.79
From eastern end of canal to Key West.....	965	232.9	1,651.26	1,068	257.8	1,827.80
Total.....	3,835	925.6	6,562.16	4,395	1,060.9	7,521.78
Delays at 15 tons per day		45	319.05		30	212.70
Total.....		970.6	6,881.21		1,090.9	7,833.48
Coal remaining on board at end of trip		956.8			476.5	
Saving in cost of fuel by going through the canal.....			43.385			42.433

The cost of sending the *Oregon* around the Horn from San Francisco to Key West was as follows:

Coal.....	\$50,266
Pay of officers and crew, rations, etc.....	42,411
Stores (except coal and ordnance stores).....	4,870
Total	97,547

Actual time taken to make the trip through the straits, sixty-eight days.
Average speed with coal taken in San Francisco, per day, 260 knots.

Days.

Time by Nicaraguan Canal (including delay of three days getting through canal).....	17
Time by Panama Canal (including two days delay getting through canal).....	19
Total saving in time by Nicaragua Canal.....	51
Total saving in time by Panama Canal.....	49

NOTE.—The distance herein given of 965 knots from San Juan del Norte (Greytown) to Key West is the shortest practicable distance, while that furnished by the Committee on Interoceanic Canals of 1,055 knots for the same route is longer by reason of a route being chosen which avoids all shoal water and is absolutely safe for navigating battle ships.

The other witnesses—Professor Haupt, Mr. Cooley, Captain Miller, Mr. Noble—and the report of Lieutenant Sullivan, all substantially agree as to these sailing distances by the two routes; but the foregoing statement from the Navy Department settles the matter beyond reasonable controversy.

Taking the distances thus ascertained, and one-half the coal consumption as the ratio for a merchant steamer of 5,000 tons, and the time saved at the average of four days on a round-trip voyage, and the loss by the Panama route in the item of coal consumption is as follows:

The per diem coal consumption on a ship of 5,000 tons.....	\$37.61
For four days, on each round trip.....	150.44
On five ships of 5,000 tons, each day it is.....	752.20
For a year it is for the single item of coal.....	274,553.00

Interest, insurance, depreciation, wages, and supplies, and interest and insurance on cargo, if they are estimated only at an equal cost, increases the loss on five ships per day to \$1,508.40, and per annum to \$550,566, and for ten years to \$5,505,660.

These estimates are on a less tonnage than passes through the Suez Canal, and on about one-third of the tonnage that passes through the Sault Ste. Marie Canal annually.

Instances that prove these facts are multiplied in the testimony of the witnesses, but these figures, taken from the voyage of the *Oregon*, are a demonstration, and I prefer to adopt them as the basis of my verdict.

THE LOSS OF MONEY TO SAILING SHIPS.

As to the loss of time on sailing ships, it is not necessary to make a calculation to compare these two routes, since the advocates of the Panama route dismiss them from all calculations "as unconsidered trifles." If we should still venture a plan, that sailing ships shall not be destroyed by excathedra declarations of their enemies, but shall have at least the opportunity to visit the great oceans through Nicaragua, where favoring winds from the heavens invite them continually, we can support that plan out of the mouths of the enemies of this great industry.

The subject has been most carefully examined by that greatest of the geographers of the seas, Mathew F. Maury, who ranks as a great admiral amongst all sailors, but was only a lieutenant and chief of the National Observatory in the old Navy, from which he resigned.

Under the orders of the Government, this subject has been carefully reexamined by Lieutenant Sullivan, and for many years it has been under the close observation of the Hydrographic Office of the Navy Department. The sailing directions of the Bureau of Navigation are in evidence on the hearings; the testimony of Captain Bryan, Captain Miller, Commander Young, and others, detailing their personal observations, and the report of the Isth-

mian Canal Commission show, beyond dispute, that the calm belt off the Bay of Panama forbids commerce to seek the Northern Pacific Ocean through the Panama Canal, while the strong and steady trade winds blow across Nicaragua at Greytown and Brito, and continue constantly and without interruption across the Pacific to the coast of China.

Between Panama and San Francisco the average loss of time for a sailing vessel is fifteen days one way, and frequently it is more than two months. Putting the loss of time for a sailing ship of 5,000 tons at one-half the sum it will cost a steamer, the loss in money for thirty days on a round trip, or \$75 per diem, will be \$2,250 on each voyage out and in. What the loss will be to the whole country through the exclusion of sailing ships from the advantages of an isthmian canal I will leave to the computation of those who have the courage to face that disastrous situation.

THE CURVATURE OF THE TWO ROUTES.

The curves on the canal line on the Nicaragua route are for the much greater part in the section occupied by the San Juan River, where the washing of the canal banks by the waves from vessels will do no possible harm and will constantly improve the channel.

The following statement from the bureau of inquiry, furnished by the great navigator, Rear-Admiral George W. Melville, utterly dissipates the contention that the curvatures of the canal as located by the Isthmian Canal Commission is either dangerous to ships or that they will reduce the speed to a minimum rate.

It would seem very sad if that Commission in their plan had so arranged it that the greatest ships could not safely pass through it with their own steam. But the following paper proves that they have made ample provision for even high speed:

WASHINGTON, D. C., March 31, 1903.

DEAR SENATOR: Answering your letter about permissible speed of ships around curves, I have gotten out the following for you, which with pleasure I now transmit:

A twin-screw ship can, on her own steam, round a curve of any radius down to one of less than her own length by the expedient of going ahead with one screw and backing with the other; her speed, meantime, will of necessity be very small, or even backward, depending on the relative speeds of the two screws.

With both engines going ahead under equal steam, the sharpest turns that can be followed by means of the rudder alone will be:

Name.	Draft.	Displacement.	Speed.	Radius.
	<i>Feet.</i>	<i>Tons.</i>	<i>Knots.</i>	<i>Feet.</i>
Brooklyn	22	9,215	<div style="display: flex; align-items: center;"> <div style="font-size: 3em; margin-right: 5px;">{</div> <div> <div>6</div> <div>9</div> <div>10</div> </div> </div>	<div style="display: flex; align-items: center;"> <div style="font-size: 3em; margin-right: 5px;">{</div> <div> <div>1,113</div> <div>1,012</div> <div>918</div> </div> </div>
Oregon:				
Port helm	26	11,460	10	480
Starboard helm	26	11,460	10	435
Indiana	<div style="display: flex; align-items: center;"> <div style="font-size: 3em; margin-right: 5px;">{</div> <div> <div>24</div> <div>24</div> </div> </div>	<div style="display: flex; align-items: center;"> <div style="font-size: 3em; margin-right: 5px;">{</div> <div> <div>10,225</div> <div>10,225</div> </div> </div>	<div style="display: flex; align-items: center;"> <div style="font-size: 3em; margin-right: 5px;">{</div> <div> <div>6</div> <div>12</div> </div> </div>	<div style="display: flex; align-items: center;"> <div style="font-size: 3em; margin-right: 5px;">{</div> <div> <div>592</div> <div>637</div> </div> </div>

The speeds given in the table are those of actual trials. At other speeds the minimum radius would not be very different, and the maximum speed at which such a short curve would be attempted would be limited only by the tendency of the vessel to heel over, a limitation which, however, is never approached in a vessel having reasonable stability.

All of the above applies to the conditions on the open sea.

In a canal the greatest permissible speed, whether on a curve or a straight

stretch, is determined by the wear and tear on the banks from the wash of the waves. At a given (wave-making) speed the waves produced in the canal are much larger than on the open sea, and their destructive action, even when the banks are protected by riprap, is such that speeds greater than 6 or 7 knots are practically out of the question.

With best wishes and respect, yours, faithfully,

GEO. W. MELVILLE.

Hon. JOHN T. MORGAN,
United States Senate.

THE CLEANSING OF SHIPS' BOTTOMS IN FRESH WATER.

As the opportunity is now directly presented, and the subject is of much importance to commerce and navigation and gives to the Nicaragua Canal route a prominent advantage over the Suez and Panama routes, I will present, without argument, a paper from Rear-Admiral Melville, chief engineer of the Navy, relating to the effect of immersion of ships in fresh water, in clearing their bottoms of sea grass and barnacles after long ocean voyages.

It is a subject of great importance, and it is to be noted that the Nicaragua Canal is the only place where this can be done while the ship is pursuing its voyage. The fresh-water navigation in the Nicaragua Canal extends for 180 miles, while in the Panama Canal it extends no more than 21 miles. If it is true that the submergence of ships in fresh water for a day will kill these parasites, they will soon afterwards drop from the vessel while on its voyage, and the impediment to speed will be removed. It is asserted by Mr. McDonell, who is a close student of such matters, that the real work is done in the submergence of the vessel for twenty-four hours by killing the parasites.

It will be seen from the following letter that our naval authorities attach great importance to this subject in respect of war vessels.

Mr. President, that is quite a lengthy letter, considering the nature of the subject, but it is so very important that Admiral Melville has gone into the subject for the ascertainment of historical facts and calculations. I shall not undertake to delay the Senate by reading the figures, as no Senator could pretend to retain them in his mind; but the advantage of the immersion of a man of war, or, in fact, of any steamer or any sailing ship, in the fresh waters of the Nicaragua Canal over a sailing distance of 180 miles—it is all fresh water in the Nicaragua Canal—in respect of the cleansing of the bottoms of ships of barnacles, seaweeds, and other crustacea, is one of the most important features connected with the whole subject. It looks like a small matter, but still, when we count the loss of speed of ships, particularly battle ships and cruisers, when speed at times is of such absolute indispensable necessity, we can save to the Government of the United States millions upon millions of dollars by passing those ships through these fresh-water lakes that otherwise would be expended in cleaning the bottoms of ships in dockyards, etc.

The letter referred to is as follows:

DEPARTMENT OF THE NAVY,
BUREAU OF STEAM ENGINEERING,
Washington, D. C., March 31, 1902.

DEAR SENATOR MORGAN: The efficiency of all vessels is greatly impaired by the foulness of the ships' bottoms. In the days of sail the resulting loss was not so great, for the hulls of the wooden ships were sheathed and therefore barnacles and grasses did not attach themselves so readily to the hull structure. The sheathing of the modern war ship and ocean steamer is practically impossible, and therefore the docking of vessels is necessary about twice a year.

The fouling of ships' bottoms depends on the time spent in cruising, the waters in which the cruise is made, and the service performed.

The loss of speed and the corresponding increase in coal consumption due from the fouling of the hull are matters that vitally concern the shipowner. As for men-of-war, the subject is of greater moment, since one of the most important factors in determining the usefulness and efficiency of the war ship is the question of radius of action, or the distance that the vessel is able to steam without coaling.

The following data will show how seriously a foul hull will interfere with the efficiency of the war ship. This data is taken from official records and has been compiled with exceeding care, since it is necessary that the Department secure absolutely correct information upon the subject.

Oregon, 10,000 tons displacement.

	Knots.
1. One-half month out of dock, speed	11.42
2. Two and a half months later, having been under way at a speed of 11 or 12 knots almost continuously (three months out of dock)	11.17
3. Three months later, having been on blockade and in tropical waters three months (six months out of dock)	9.6

The same horsepower, practically, was developed and the same conditions obtained in all three of these runs.

The loss of speed, then, in two and a half months, with the vessel under way almost continuously, was 0.25 knots, while after three months more, with the vessel on blockade and in tropical waters, the loss of speed was 1.5 knots.

Philadelphia, 4,325 tons displacement.

	Knots.
1. With half power, clean bottom (1½ months out of dock)	13.22
2. Same power, 3 months later, after having been under way about half the time (4½ months out of dock)	11.9
Three-quarter power, 6 months later, after lying in the harbor of Honolulu 6 months (10½ months out of dock)	10.19

These results can not be compared as well as the ones for the *Oregon*, but the speed of 10.19 knots made with three-quarter power compared with 13.22 knots made with half power shows a loss of speed equivalent to 3.5 knots had the powers been the same.

Detroit, 2,000 tons displacement.

	Knots.
1. On half power, clean bottom	10.28
2. After lying 4½ months in a tropical harbor	7.95

Same power for both runs.

Nashville, 1,371 tons displacement.

	Knots.
1. With clean bottom made	10.26
2. With seven months' cruising in the Philippines, same power	8.46

Celtic, collier, 6,428 tons displacement.

	Knots.
1. One-half month out of dock; trip, Sydney to Manila	10.4
2. Six months out of dock, Manila to Sydney	9.4

Same power for both runs.

Hannibal, collier, 4,291 tons displacement.

	Knots.
1. With clean bottom, Hampton Roads to Ponce, P. R.	10.00
2. One and six-tenths months later, Ponce to Hampton Roads, same power	8.82

These results cover a wide range of conditions. The second run of the *Oregon* shows the least loss of speed (0.25), the vessel having been under way at a comparatively high sustained speed. The greatest loss of speed is shown in the case of the *Philadelphia*, third run, when the loss of speed was over 3 knots, notwithstanding the fact that three-quarters power was used on the third run and only half power on the first run. (Loss would have been 3.5 knots with the same power.) Under average conditions of cruising vessels with a sustained speed of 9 to 11 knots lose 1 to 3 knots after six months out of dock. The loss is very much greater than this with vessels lying in tropical ports for a considerable length of time, and less if cruising continuously.

If a vessel is immersed in fresh water, the effect is to clean the bottom of barnacles and sea grasses to some extent. The following data shows a comparison of performances of several vessels before and after having been in

fresh water, and their performance with clean bottoms. The conditions and power developed were practically the same for each set of results:

<i>Monterey.</i>		Knots.
With clean bottom made		10.00
With foul bottom (just before entering the Columbia River)		9.00
After leaving the Columbia River, having been in fresh water for 44 days		9.73
<i>Monadnock.</i>		
With clean bottom made		9.5
With foul bottom (just before entering the Columbia River)		7.88
After leaving the Columbia River, having been in fresh water for 14 days		9.01

Scorpion.

This vessel was in the Mississippi River for fifty-seven days. Data for accurate comparisons could not be obtained, as the runs before entering the river and after leaving it were under such different conditions that comparisons were impossible. However, the vessel was eight and one-half months out of dock on entering the river, and after leaving made 11.49 knots on power that would have given 11.6 to 11.7 knots had the bottom been clean. Undoubtedly her condition was greatly improved.

These results show that when vessels with foul bottoms are immersed in fresh water for a considerable length of time the condition of the hull is greatly improved, from two-thirds to three-fourths of the loss of speed being recovered.

The least time spent in fresh water by any of these ships was fourteen days.

Unfortunately there is no data available for shorter periods, and I regret that I am unable to give you any information as to the effect of time on the cleansing of ships immersed in fresh water.

Yours, truly,

GEO. W. MELVILLE,
Engineer in Chief, U. S. Navy.

Hon. JOHN T. MORGAN,
United States Senate, Washington, D. C.

CLIMATE, TEMPERATURE, AND HEALTH OF THE MIDWAY STATIONS AROUND THE WORLD.

If this advantage meets the anxious expectations of our naval officers and commercial navigators and dry docks are constructed in Lake Nicaragua they will add immensely to the sea power of the United States and will, with other attractive features of the climate and the productions and the sea air blowing across that country make the Nicaragua Canal route so attractive to navigators that those who control that canal route need not fear competition with the Suez Canal and the Red Sea, which is the hottest region of the world accessible to ships. As the midway station of the equatorial zone of navigation around the world, one of the most useful features will be the docks for cleaning and repairing vessels, while the ships' companies will find rest and refreshment after long voyages. It is the only way station where such facilities can be found grouped together. They are far too important to be lightly considered.

PAGE 103 OF THE REPORT.

I will now close this outline statement of this great subject with an inquiry that is not intended as a criticism, but is intended to point out the fact that the statements on page 103 of the final report of the Isthmian Canal Commission, which the hunger of the Panama Canal Company provoked them to snap up as if it had been prepared as a bait, was not considered or prepared by that commission with any such purpose. It was evidently prepared only to satisfy Congress that the offer of the Panama Canal Company to sell its concessions and their belongings for \$109,000,000 was too exorbitant, and to dismiss that subject from further consideration.

That commission had no authority under the law to make or to accept any offer of purchase or sale connected with the canal, and

they repeatedly so informed M. Hutin, who was the general manager of the Panama Canal Company.

Even the President of the United States had not the authority to make or accept any such offer, under the statute. His express duty was to recommend a route for the acceptance of Congress, after he had employed the commission in ascertaining the facts relating to the practical question, not the diplomatic or political question, of the practicability and feasibility of the respective routes and the material advantages and disadvantages of both routes.

It was the sole and exclusive duty of the President to determine which route he would recommend to the acceptance of Congress. In performing that duty he would necessarily obtain light from sources that were closed against the examination of the Commission and even of Congress, unless he chose to invite Congress into his confidence as the diplomatic head of the Government under the Constitution.

The shrewd traders of the Panama Canal Company having failed for five years to involve the United States in the partial joint ownership of a property that was already wrecked in value and scandalized in character, they found, on page 103 of the report of our Commission, a bed on which its fall could be broken, and they suddenly dropped their price for the wreck all the dizzy distance from \$109,000,000 to \$40,000,000. The fall was so startling as to shock all observers, but the agile performers discovered the safety net and leaped for it. It was a desperate leap, but they had faith in the reputed American fondness for glittering temptations in the way of bargains. It rests with Congress to say whether they have made any serious miscalculation.

If we would be magnanimous to those who are performing this apparent act of *felo de se*, let us lend them the money, with Colombia as security, and let them proceed with their costly experiment. If we are ready to accept the inviting bargain, at the expense of their suffering and apparent loss, let us play true to the character and price the property at the sum that it would cost us to reproduce it.

When we have paid Colombia for the privilege of buying the canal and the railroad stock, we will abandon the role of shrewd and heartless dealers, to which character we will be forever doomed in the estimation of the French people, whatever else we may do, and when we pay a percentage of \$10 on each share for the railroad stock, the par value of which is \$100, we will be written down as dolts. And so, when we pay \$2,000,000 for maps, the useful parts of which have been thrust upon us as a donation—if we pay \$2,000,000 premium on the maps under the head of “contingencies,” we will lose our reputation for shrewd dealing, and will be classed as very common and foolish people who do not know what to do with their money.

REASONS FOR AN EXCHANGE OF MAPS.

If the inducements for cheap bargains are to be a feature of the trade, it would be well to offer them in exchange for their maps our Nicaragua maps, that represent to us a cost of at least \$2,000,000. They could be kept for a time of need; which time will surely arrive when the railroads, or the men who are to get the \$40,000,000, shall take up Lull's or Menocal's plan and build a cheap slack-water canal for \$65,000,000, in combination with Costa Rica and Nicaragua.

Our owners of sailing ships could afford to build such a canal for the accommodation of our coastwise trade. Such an enterprise is no more than Great Britain accomplished with the Suez Canal, after using all its powers short of war to defeat its construction.

That this subject is in the minds of the persons connected with the Panama Canal, is manifest from the statement of General Abbott in his deposition, on pages 838-840.

What our situation would be with a canal between our coast and the Panama Canal when completed by the United States is a subject worthy the attention of thoughtful men. How we could prevent such a situation, under the recognized right of Costa Rica and Nicaragua to build a canal with money borrowed in trans-oceanic countries or in South America or in Mexico and Cuba is a problem that will demand solution whenever we build the Panama Canal, 600 miles away from our coasts.

WHY THE ESTIMATES ON PAGES 101 AND 103 WERE MADE.

It is evident from the report of the Commissioners, on pages 101-103, that the inventory of the assets of the Panama Canal and the railroad stock and its appraisalment was intended to convince Congress that the actual value of it to the United States, even when swollen by 30 per cent of contingencies, was far below the estimate of \$109,000,000 put on the property by the French appraisalment. That appraisalment is \$19,000,000 greater than the estimate of M. Hutin, made to President McKinley in the letter of January 18, 1899, addressed to him by Mr. Cromwell, general attorney for the Panama Canal Company.

M. Hutin must have had some strong encouragement in America for thus raising the price of this property from \$90,000,000, in January, 1899, to \$109,000,000 in November, 1900. It must have been this that stimulated him to attack the Isthmian Canal Commission, and especially Admiral Walker, for misleading him, which M. Hutin did in a letter addressed to the Secretary of State, dated November 22, 1901. In this letter M. Hutin exhibits petulance and resentment because his estimates were rejected without discussion, and without the acceptance of an arbitration proposed by him to ascertain these values, for the want of authority to agree to it.

He demanded that Admiral Walker should print their correspondence in his official report to the President, which was done, without any good reason, notwithstanding the fact that M. Hutin has suppressed Admiral Walker's letters of October 22, 1901, to him, which utterly destroyed the ground of his complaint to the President, through his letter to the Secretary of State. (See Report No. 1, Fifty-seventh Congress, p. 127.) This company has not been able to forget the large sums paid to its American committee by the old company for influence, or that it succeeded in tempting a Secretary of the Navy to quit the Cabinet and become its agent and promoter, on a salary of \$25,000 per annum, and the audacity of the company is correspondingly aggressive.

WHY THE SUPPOSED COMMITTEE, ON PAGE 103, WAS SEIZED UPON AS AN OFFER OF PURCHASE.

When M. Hutin had delivered this Parthian arrow at Admiral Walker and returned to Paris, the Hepburn bill passed the House of Representatives by a vote wanting only two votes of unanimity, and General Abbott says a panic ensued in the Panama Company.

M. Hutin was deposed and M. Bo was elected general manager of the Panama Canal Company. The price of the property was dropped to the \$40,000,000 mark, assumed to have been prepared as an offer of purchase, by the report of the Commission on page 103. Sixty-nine millions of property values was thrown away in the "panic," and the wheels of justice in the French courts revolved rapidly to anticipate results and to confirm the acceptance of the proposed agreements before they were made or accepted by anybody, which provisional arrangements the ocean cable was taxed to send to Washington.

Hot haste was winged with lightning to stop the Senate from passing the bill which had just passed the House of Representatives. The innocent and loose estimates of page 103 of the report of the Isthmian Canal Commission was identified by M. Bo by reference to a single page of that report, when the estimate included two pages, and was seized upon by telegram as a solemn offer of the Government to pay money for property valued at a fixed price, which cash value was increased \$4,942,038 by the addition of contingencies.

And Congress is now asked to appropriate this sum to meet the contingency, that our Commission had really undervalued the property in their report of its actual value made to the President. If we accept it, we do so as a glittering success in making a bargain for property that our Commission had greatly undervalued. If we accept what the Commission say, and what the proof shows to be true, we can not do this on account of any just regard for the men who are trying to save themselves at the expense of many thousands of innocent people, who have been grossly defrauded by them.

WHAT THE FACTS STATED IN THE REPORT ACTUALLY SHOW.

The report shows the actual value of the work done in its present condition. It is all excavation and embankment, capable of being estimated in cubic yards at current prices for labor, and there is no other sort of work, so that the calculation is simple and no room is left for contingencies. This sum allowed for contingencies is only less than the whole difference in the cost of the canals by the sum of \$291,361, as the same is estimated by the Commissioners.

On page 102 of their report the Commissioners say:

The concession is of no value to the United States since a new one must be obtained from the Colombian Government in any event. It is the same with the lands, title to which is dependent upon the completion of the canal, and is still to be earned.

Much of the property is ill adapted to American methods, and all of it is now from thirteen to twenty years old, during which period the improvements of this class of machinery have been such that contractors would generally find it to their advantage to buy entirely new machinery of modern pattern, rather than attempt to use this of an older class, even if it was given to them.

The same is true of the greater part of the buildings, including all barracks, storehouses, shops, stables, and miscellaneous buildings, and excepting only hospitals and principal administration buildings. The latter would be the subject of special negotiation. They have appeared in the estimate under the head of contingencies. No special allowance is made for them.

All this means that the canal machinery and the buildings, except the hospitals and principal administration buildings, are of no value to the United States, and that those that are of value are included under the estimates for contingencies. Therefore these excepted buildings are to be paid for at the sum of \$4,579,005, with 10 per cent on that, \$457,900, making a total for houses,

\$5,036,905. This 10 per cent is said to be "omissions," but there are no omissions of articles to be purchased, for on page 101 there are 11 classes of articles of which a full description, by items, is given in an "inventory furnished to the Commission."

Under the statement of the value of the property made by the Commission, the value of canal excavation is \$21,920,386. The value of houses is \$5,036,905. The value of maps is \$2,000,000. The value of railroad stock is \$6,850,000. Total, \$35,807,291. Here is a gap of \$4,192,709 to be filled by Chagres diversion, \$178,187; Gatun diversion, \$1,396,456; railroad diversion, \$300,000; total, \$1,874,642, leaving \$2,318,067, for which there is nothing to answer but a bonus or placebo. With \$2,000,000 for maps and \$2,318,067 for bonus, we have \$4,318,067 in this \$40,000,000 for which we have nothing of value to show.

This is more than half the sum that Nicaragua asks for perpetual and exclusive canal rights and privileges through the heart of her country. In any light in which these estimates can be viewed they can not be justly regarded as fixing the actual cash value of the property. They were never intended as such, and Congress, if it appropriates this money, should find a more solid basis for the appropriation than this loose and conjectural estimate, made to show the exorbitant price set upon it in the indefinite and incomplete offer of M. Hutin.

If our Commission is to have credit for high diplomatic ability in driving a good bargain with the failing Panama Canal Company, their estimates of the value of the property they purchase, as stated by them in detail, should come nearer to a balance with the round sum of \$40,000,000 than the sum of \$4,318,067, which is their nearest approximation to a balance, and when this difference is taken into account in estimating the actual cost of completing the Panama Canal as compared with the cost of the Nicaragua Canal, it reduces the difference to \$1,312,637.

And it is for this sum we are asked to yield all tolls forever from sailing vessels, half the competition of the canal with the transcontinental railways, 600 miles of shorter lines for our warships, more than 100 miles of voyage in fresh water for ships that are fouled with sea travel, and the speed gained by them by immersion in the river and Lake Nicaragua. And we tax sailing ships with 10,000 miles of sea voyage through cold and dangerous seas around Cape Horn, and steamships with a loss of four days on a round trip between our Atlantic ports, at a cost of \$150 per day on a 5,000-ton ship. For this we compel the wheat growers and lumbermen of the great Pacific slope to cross the Pacific to find the markets of Europe, instead of the markets of our Gulf and Atlantic States.

When we have concluded this brilliant bargain we shall find, like poor Richard, that we have paid too dear for our whistle.

THE COST OF MAINTENANCE AND OPERATION OF THE CANALS.

I will allude to the expenses charged to the respective routes for operating expenses and the maintenance of way, to add only a few observations that need to be made.

Under this head there are no items given in the report of the Isthmian Canal Commission as to which a computation can be made in order to test the accuracy of their estimates, or the cost of maintaining and operating any other canal as an approximate criterion.

The cost of maintenance, per mile, of the Suez Canal is \$13,000; of the Kiel Canal, \$8,600, and of the St. Marys Canal from \$46,000 to \$60,000 per mile.

The St. Marys Canal is only $1\frac{1}{2}$ miles long and has all the advantages of concentration. At the rate of \$1 per ton, its income during the eight months it is open during the year would be more than \$30,000,000. It is the force employed in handling the traffic in the open months that costs so heavily.

The basis of these estimates was discussed by the Commission, but it was not given in their final report, because it was not agreed upon. It was produced by Colonel Ernst, on his examination, and is found in his deposition on pages 687 to 698 of the hearings.

The scheme of government is elaborate, even grand, and is quite ample in officials and salaries for the government of a commonwealth. It consists of a supreme board of control, at Washington, and an engineering department, A, with a governor at a salary of \$15,000, and the other salaries are correspondingly high for five other departments.

The risk of life in the climate of Panama may excuse this extravagance for that canal, but it is without justification for Nicaragua. The following summary of these items will show the great magnitude of this plan:

THE SALARIES OF FIVE MEMBERS OF THE SUPREME BOARD OF CONTROL AND THEIR SUBORDINATES IS NOT GIVEN.

Annual cost of maintenance of both canals.

ANNUAL COST OF MAINTENANCE, NICARAGUA CANAL.		ANNUAL COST OF MAINTENANCE, PANAMA CANAL.	
Salaries, etc., of governor.....	\$39, 800	Salaries, etc., governor.....	\$39, 000
Engineering department, A:		Engineering department, A:	
268 employees	187, 780	170 employees.....	128, 640
Plant.....	397, 400	Plant.....	211, 600
Supplies	100, 000	Supplies	50, 000
$7\frac{1}{2}$ per cent depreciation	620, 532	$7\frac{1}{2}$ per cent depreciation	407, 372
Total.....	1, 305, 712	Total.....	797, 612
Transit department, B:		Transit department, B:	
390 employees	346, 160	153 employees.....	142, 840
Plant.....	320, 500	Plant.....	150, 000
Total.....	666, 660	Supplies for locks	9, 000
Medical department, C:		Lights on locks.....	4, 500
84 employees.....	70, 980	Maintenance of railroad	45, 000
2 launches.....	5, 000	Total.....	351, 340
Supplies	50, 000	Medical department, C:	
Total.....	125, 980	74 employees.....	64, 800
Finance department, D:		2 launches	5, 000
15 employees.....	27, 200	Supplies	35, 000
Supplies	500	Total.....	104, 800
Total.....	27, 700	Finance department, D:	
Law department, E:		14 employees.....	26, 800
13 employees.....	18, 200	Supplies	500
Supplies	500	Total.....	27, 300
Total.....	18, 700	Law department, E:	
		8 employees.....	14, 800
		Supplies	500
		Total.....	15, 300

Annual cost of maintenance of both canals—Continued.

NICARAGUA CANAL—continued.		PANAMA CANAL—continued.	
Police department, F:		Police department, F:	
443 employees.....	\$500,800	213 employees.....	\$241,100
30 horses, at \$250.....	7,500	40 horses, at \$250.....	10,000
Supreme control in		General expense in	
United States.....	100,000	United States.....	100,000
Total.....	608,300	Total.....	351,100
Grand total.....	3,350,000	Grand total.....	2,024,174

The law department at Panama is put at \$15,300, for providing the legal regimen for 35,000 resident people, while it is put at 18,700 at Nicaragua, where not more than 2,000 people now reside.

The police department is put at \$251,100 at Panama, where there are 35,000 unruly people to control, and at \$508,300 at Nicaragua, to control a scattered population of 2,000, quite orderly and peaceable people.

The finance department is put at \$27,700 at Nicaragua, and \$27,300 at Panama. The amount of money to be received in tolls is supposed to be the cause of this discrimination against Nicaragua of \$400 in the expenses.

The medical department is made to cost \$125,000 at Nicaragua, in a healthy country, and 13 medical officers, 6 stewards, 36 nurses, and 18 laborers are provided, while the total cost of the medical department at Panama is \$104,860, with 7 medical officers, 3 stewards, 12 nurses, and 6 laborers at emergency hospitals, and 5 medical officers, 2 stewards, 20 nurses, and 10 laborers at the regular hospital. The difference of \$20,620 per annum is made in favor of Panama, where the pestilential character of that region is described as "fever hole" by General Alexander, and is known of all men to be a region where the yellow fever and chagres fever have their habitat, from which they are never absent. It is so in each of the departments of this proposed government, which seems to have been created to form a basis for the calculation of maintaining an isthmian canal and then retired from observation for future use.

THIS STATELY PROGRAM FOR WORKING A CANAL, AS IF IT WAS A KINGDOM, IS RESPONSIBLE FOR THESE TREMENDOUS ESTIMATES OF EXPENSES.

It is in this programme that the idea had its origin that \$2,024,174 was required for maintenance and operation of the canal at Panama, and that \$3,350,822 is required for the canal at Nicaragua. The difference of \$1,326,644 is ample to operate either canal, if we accept the experience at the Suez Canal, the Sault Ste. Marie Canal, or any other canal between great bodies of water.

It is impossible to know or safely to conjecture by what rule or principle the Isthmian Canal Commission fixed the charges of maintenance and operation of the canal at Nicaragua or compared them with those of the Panama Canal. For engineering, police, sanitation, and general contingencies their estimate of the cost of construction of the canal is \$31,644,010. This evidently includes all the plant that is needed for these purposes, and for a canal completed and equipped. Then they add other sums for plant, for the maintenance of all the canal purposes, for keeping the canal in good order, and for vessels and other appliances needed for such service.

The contingencies charged to the Nicaragua Canal are \$558,470 in this plan of government, and those charged to the Panama Canal are \$337,362, a difference of \$221,118 annually, while the

steam tugs, inspection steamers, dredges, pile drivers, tugs, scows, pilot boats, naphtha launches, canoes, and saddle horses, which in their nature can not be reasonably expected to be resupplied each year, are charged at full cost, which is very great, for each year, as if they would all disappear after a single year of service.

These estimates, which are far too extravagant and are so loosely made, and these salaries and pay rolls, which are very expensive, account in great part for the charge of \$3,350,822 to the Nicaragua Canal for maintenance and operation, when the Chief of the Bureau of Statistics, in December, 1900, said in an official bulletin of that date:

There are no locks on the Suez Canal, but the channel is through drifting sand for a great part of its length. The entrance to the harbor of Port Said, on the Mediterranean, intercepts the drift of sand discharged from the Nile and carried along the coast by the easterly current. The navigation in which steamships can make full speed if they chose is longer than the entire length of the Suez Canal. The line of canalization on land at Nicaragua is 53.50 miles, only about half that of the Suez Canal, and only 6 miles longer than the Panama Canal, all of which is artificial canal.

Suez has 100 miles of navigation through an artificial channel, and Panama has 47 miles, while Nicaragua has 63 miles of artificial channel and 120 miles of river and lake navigation in which there are no locks. On this state of facts it is impossible that any reason can be stated why it should require \$18,310 per mile to maintain 183 miles of canal, of which only 63 miles is of actual canalization, when the cost per mile of the Suez Canal is \$13,000, and that canal is dug entirely through the desert sands, which blow into it and make constant dredging necessary to keep it open.

That is the official statement of your Government, which knocks the estimate of the canal commissioners into dust. Nobody is responsible for that but your Government.

It is beyond all reason and experience that the more than 100 miles of deep water on the route of the Nicaragua Canal, where there is no lock and where a dredge will never be used, should be charged annually with \$1,741,400 for cost of maintenance and operation. It is on this absurd conjecture that this erroneous calculation has been made. When this sum of \$1,741,400 is subtracted from the estimate of \$3,350,822, made by the commissioners, it still leaves \$1,611,422 to be applied to maintenance and operation, which is still more than is expended annually on the Suez Canal for those purposes by the sum of \$311,422, which is more than the estimates of the Isthmian Canal Commission for operating and taking care of the locks, with 20 per cent added for contingencies.

The uncertainty of the situation as to the cost of maintenance and operation of the canal, created by this effort to fabricate a great and expensive system for its government and control, has introduced into this subject an element of doubt and confusion of a serious character.

It would not have existed if the commissioners, at the time they made this report, had been confronted with the \$40,000,000 proposition of the Panama Canal Company. They then had no doubt that this company was acting sincerely in the statement that \$109,000,000 was the sum, below which, they would not sell the ditch, the maps, and the railroad stock, with the right, without objection from them, to purchase new concessions from Colombia; and they had no special reasons for closely estimating the cost of maintaining and operating the canal, as to which there must always be a margin of doubt.

The effort was made, on a plan of great amplitude, to institute a very costly government for the canal, but it failed in committee

and was not sent to the President with their report, and it is this abortive scheme that is now presented as the estimate of great engineers, carefully made, as to the difference of the cost of maintenance and operation as between the two routes.

The number and salaries of the official corps, the cost of the plant, to be renewed, annually, and the contingencies, have no actual relation to the experience of governments in respect of other canals. They are arbitrary suggestions, and are not calculations based on facts that are even alluded to as supporting the plan.

The following statements in the deposition of Colonel Ernst sufficiently explain this situation:

The CHAIRMAN. About what is the population of Panama?

Colonel ERNST. About 20,000, I think.

The CHAIRMAN. And about how much in Colon?

Colonel ERNST. About five or six thousand.

The CHAIRMAN. Is there any considerable number of French citizens or people located in Panama or Colon permanently?

Colonel ERNST. Well, I fancy not. Of course, most of the people that we saw were French. They were the officers of the canal company, but I do not think there are many outside of those officials.

The CHAIRMAN. Are there many French residents in that part of the country, in those cities?

Colonel ERNST. I did not see any.

The CHAIRMAN. In the sanitation that is necessary on the Panama route, would you feel that it was safe without including the city of Panama and the city of Colon?

Colonel ERNST. No; I can not say that I think it would be safe.

The CHAIRMAN. How far is the city of Panama from the line of the canal as it is dredged from the bay there?

Colonel ERNST. It is about 3 miles.

The CHAIRMAN. That would be included in the canal limits, if they were 3 miles wide?

Colonel ERNST. I certainly would prefer that they should be included.

The CHAIRMAN. Would you not think that it was absolutely necessary to include it in order to preserve the sanitation, or whatever results might come from sanitation, on the Panama route?

Colonel ERNST. I think the result would undoubtedly be better with it. It is a question of degree. You certainly could not have the same sanitary state there without that city as you can with it.

The CHAIRMAN. That would apply equally well to Colon?

Colonel ERNST. Yes; but Colon is nearly all owned by the Panama Railroad Company, and if you buy that you buy the city.

The CHAIRMAN. Well, I think that is a legal question. Suppose, however, that we bought it and got the title to all the property that had passed through the hands of the railroad company and under concessions from Colombia, it would be still necessary to have the control of it in order to accomplish this sanitary purpose?

Colonel ERNST. I think so.

The CHAIRMAN. Well, it would be also necessary to have the control of it for police purposes?

Colonel ERNST. Yes, sir.

The CHAIRMAN. What sort of a population is there at Colon and at Panama?

Colonel ERNST. Well, I could not say that it was a very high order of population. I did not come into very close personal contact with it. I would say, however, that they were a rather low order of people, a great many of them. Of course there are some respectable people there.

The CHAIRMAN. A very mixed population?

Colonel ERNST. Yes, sir.

The CHAIRMAN. They are a turbulent people, too, are they not?

Colonel ERNST. I would say they are; yes, sir.

The CHAIRMAN. Hard to manage?

Colonel ERNST. They are fighting and quarreling all the time; yes, sir.

The CHAIRMAN. And they are insurrectionary?

Colonel ERNST. Yes, sir.

The CHAIRMAN. We have had several occasions when we have had to send ships of war down there with marines aboard in order to preserve the peace and save the property that the French people have got on that Isthmus, and also to protect and guarantee the sovereignty of the Republic of Colombia over the State of Panama. That is in our treaty.

Colonel ERNST. Yes.

The CHAIRMAN. Now, in making up your estimate of the maintenance of the Panama Canal, the current expenses of maintenance and preservation and protection, etc., I suppose you took all of those elements into consideration?

Colonel ERNST. Yes.

The CHAIRMAN. Did you include the sanitation and the police control of the city of Panama, with 20,000 inhabitants?

Colonel ERNST. We did not in terms. The way we did that was to draw up an organization for the management of the canal, a separate board of control here in this country consisting of 5 members, a governor on the Isthmus with his staff and office, and then provide for 6 departments, the engineering department, with all its various assistants and appliances and the material required; the transit department, having charge of the regulation of dues and the transit and management of all pilots and all that sort of thing, and the light-houses; the medical department, charged with the quarantine regulations, the general hospitals, and the hospital supplies, the subordinate hospitals, and sanitary inspection; the police department, and a law department, and a finance department.

We had all those worked out in detail, and the medical department was charged mainly with the hospitals and subhospitals and the sanitary inspection and the quarantine service. Now, we allowed a force necessary for that, without taking into account any great city.

The CHAIRMAN. You took into account the men who were connected with the operation of the canal?

Colonel ERNST. Yes.

The CHAIRMAN. And the railroad?

Colonel ERNST. And the railroad. The general hospitals, which would be some little way off, probably, from the canal.

The CHAIRMAN. But you made your estimate on the number of men that would probably be employed in the navigation and management of the canal and railroad?

Colonel ERNST. Yes.

The CHAIRMAN. You did not include in it the citizenship of these cities?

Colonel ERNST. No, sir.

The CHAIRMAN. Could you name here the appendix that contains those estimates? We have been very much at a loss to find out about them.

Colonel ERNST. We did not publish those, because it is purely theoretical; we felt that we could not defend every estimate of it. We felt that there were errors both ways. You can conceive of the difficulty of getting up of such an organization at a desk for a great work like that, which must actually be tested and corrected in practice. I mean it must be adjusted. There are many of those items that we felt would err, some on one side and some on the other, and we thought that they would correct each other; but doing it the same for both lines, we thought it was a fair comparison.

The CHAIRMAN. You made a comparison in your own minds, based upon facts that you yourselves had observed on the line or had learned from other sources, but you did not make up an itemized statement and balance sheet between the cost of maintenance on the one route and the other?

Colonel ERNST. Oh, yes; we went through this organization for both canals. Of course the Nicaragua Canal had the same general control. The governing board in this country would be the same as for the Panama and also the governor and his staff on the Isthmus would be the same and the chiefs of these departments would all be the same. Now, when it came to the number of posts you would have to have for police force, there would be more on the Nicaragua than on the Panama. We would have to have more engineering divisions.

The CHAIRMAN. What I want to get at is whether the items were put down on the list.

Colonel ERNST. Oh, I have got them all, and I would be very glad to show them to you. I have not got them here to-day, but I can bring them if you wish to see them.

The CHAIRMAN. They were not published?

Colonel ERNST. No.

The CHAIRMAN. I would be very glad if you will furnish us with them, because we have had a great difficulty in getting at the items of the estimate.

Colonel ERNST. It is one of those things that we are perfectly aware is open to attack, because they are approximations, but they are identical for the two lines.

The CHAIRMAN. You will furnish them to us?

Colonel ERNST. Yes.

The CHAIRMAN. Then I will not go any further into that question.

Additional statement of Col. Oswald H. Ernst:

The CHAIRMAN. Did you get the paper I referred to?

Colonel ERNST. Yes; here it is.

The CHAIRMAN. I would like very much to have this go into the record. It may become very important if the canal should be built.

Colonel ERNST. It is very carefully gotten up. The reason we did not publish it is because there are undoubtedly errors in it. Estimates are too high in some respects and too low in others. We thought they would correct each other. The comparison, however, is a fair one. It is the same for both canals. It is a study to which we devoted a good many weeks. It is as follows:

TENTATIVE ORGANIZATION FOR THE MAINTENANCE AND OPERATION OF THE CANALS.

I. NICARAGUA CANAL.

Supreme control to rest in a board of five members, located in Washington. The duties of the board will be:

1. To make regulations for the government of the canal, including the tariff of charges, navigation rules, police and sanitary rules, and, in short, all rules required for the operation and maintenance of the canal.

2. To make or approve all appointments, the salary of which equals or exceeds \$100 per month.

3. To make or approve all contracts.

4. To audit all money accounts before transmitting them to the Treasury Department.

The annual expenses of the board may be placed at \$100,000.

Organization on the Isthmus.—The general control to be vested in a governor, having his headquarters at Greytown, where the general offices will be located.

The administration will be divided among six departments, viz:

A. Engineer department, charged with all the maintenance and improvement of the canal, including the repair shops and storehouses, and the repairs of public buildings; also with the location and sale or rental of lands.

B. Transit department, charged with the navigation of the canal, the assessment of dues, the service of the ports, including light-houses, and the operation of telegraph and telephone lines.

C. Medical department, charged with the hospital and other medical service, including port, quarantine, and sanitary inspection service.

D. Finance department, charged with the collection of dues, payment of salaries, and management of the funds.

E. Law department, charged with the supervision of such minor courts as may be established and with all legal matters.

F. Police department, charged with the preservation of order and with the management of the armed force required for that purpose.

The governor.—The governor will issue orders to the heads of departments, will make reports to the board of control, and conduct all correspondence with that board, and will make frequent inspection of all parts of the canal. Attached to his office will be a secretary, two clerks, two messengers, and one small inspection steamer, the latter to be available for other officials when not required by the governor.

Annual expense of governor's office.

Salaries:	
Governor.....	\$15,000
Secretary.....	5,000
Clerks, 2 at \$1,500.....	3,000
Messengers, 2 at \$400.....	800
Inspection steamer.....	15,000
Office supplies.....	500
Total.....	39,300

A board of five members in Washington, for the government of the Philippine Islands, with salaries corresponding with those of the Isthmian Canal Commission of \$60,000 a month, would be quite as safe and useful, as this proposed board would be for the government of an isthmian canal and, probably, more expeditious in getting through with their work.

No salaries are named for this supreme board of control, and the only precedent we have on that point is that it would cost not less than \$60,000 each year.

The estimated contingencies of \$558,470 for the Nicaragua route and \$337,362 for the Panama route, in all \$895,832, included in the cost of this plan of canal government, would safely cover the estimate of \$60,000 and provide living salaries for the five members of the board of supreme control, and still leave enough to

pay the salary of the governor, at \$15,000 per annum, and his official staff, and for a steamer for their use, which is summed up at \$39,300 per annum. The total annual expense of the supreme board of control and of the governor's executive department is not to be less than \$783,000 in the plan proposed for the government of the canal. This plan, although it was not adopted, is the actual basis of computation of the cost of the maintenance and operation of this canal.

Yet it is no hazardous venture to assert that, with a good, honest, industrious, and reliable engineer at the head of the enterprise, this array of salaried officials could be dispensed with far more safely than they could be employed in the conduct of the work.

It has required the estimates that were made for this novel, extravagant, and dangerous plan of canal government to support the estimates of the commission for the maintenance and operation of these canals, which have no support in the actual experience of any other canal in the world.

An argument against the Nicaragua Canal based on such estimates has no just support in fact and no sanction in the history of any other canal.

Mr. President, I have not attempted to discuss a single question that I have presented upon the mere weight of the conflicting testimony. As to many of the matters there is not one particle of conflict. The very leading issues upon which I plant myself in this case and upon which the majority of the committee plant themselves are sustained by proofs against which there is no objection and about which there is no controversy.

At the expense of very great personal risk and labor, and doubtless at the expense of the patience of the Senate, possibly of the country, I have undertaken to present those leading issues and the facts that sustain them absolutely and without controversy, for the consideration of the Senate of the United States, in giving to the majority of the committee that support of truth and justice in their action in this great case which is due to the occasion and to their own character and to the country we serve and to the prosperity we are trying to advance. I am grateful, indeed, to the Senate for having permitted me to stand this long time on my feet, even in the absence of many Senators, and trust that those who were away will take occasion, when it suits them to do so, to read what I have had to say.

APPENDIX I.

List of sailing vessels over 250 tons built in 1901 in the United States.

Name.	Tonnage.	Builder and where built.
A. F. Coates	716	Geo. H. Hitchings, Hoquiam, Wash.
A. W. Thompson	2,279	American Shipbuilding Co., West Bay City, Mich.
Acme	3,288	Arthur Sewall & Co., Bath, Me.
Ada F. Brown	1,456	Chas. V. Minott, Phippsburg, Me.
Adelaid Barbour	1,336	W. S. Currier & Co., Newburyport, Mass.
Advent	431	North Bend Mill Co., North Bend, Oreg.
Apena	970	Hall Bro's. Shipyard, Port Blakeley, Wash.
Alumna	696	North Bend Mill Co., North Bend, Oreg.
Alvena	772	Bendixen Shipbuilding Co., Fairhaven, Cal.
Amaranth	1,109	Mathew Turner, Benicia, Cal.
Annie	613	Carleton, Norwood & Co., Rockport, Me.

List of sailing vessels over 250 tons built in 1901 in the United States—Cont'd.

Name.	Ton- nage.	Builder and where built.
Arthur Seitz	2, 207	H. M. Bean, Camden, Me.
Aurora	1, 211	Everett Shipbuilding Co., Everett, Wash.
Baker Palmer	2, 792	Walt's Shipyard, Waldoboro, Me.
Balboa	777	Hall's Shipyard, Port Blakeley, Wash.
Cardenas	1, 576	Kelley, Spear & Co., Bath, Me.
Chas. H. Clink	522	Palmer's Shipyard, Noank, Conn.
Chas. S. Hirsch	620	Kelley, Spear & Co., Bath, Me.
Chehalis	723	Bendixsen Shipbuilding Co., Fairhaven, Cal.
Cordelia E. Hayes	1, 281	Percy & Small, Bath, Me.
David Evans	821	Marshfield, Oreg.
E. B. Jackson	682	Lindstrom's Yard, Aberdeen, Wash.
Edith G. Folwell	1, 263	New England Co., Bath, Me.
Eldorado	881	Lindstrom's Yard, Aberdeen, Wash.
Emily I. White	352	E. J. White, Machias, Me.
Francis C. Tunnel	1, 476	Warren Sawyer, Millbridge, Me.
Frederick W. Day	613	Kelley, Spear & Co., Bath, Me.
Gamble	726	Hall's Shipyard, Port Blakeley, Wash.
Georgina	998	Bendixsen S. B. Co., Fairfaxen, Cal.
Henry B. Fiske	847	George A. Gilchrist, Belfast, Me.
Inez N. Carver	730	New England Co., Bath, Me.
J. C. Strawbridge	861	H. N. Bean, Camden, Me.
Jacob M. Haskell	1, 778	Cobb, Butler & Co., Rockland, Me.
James Johnson	1, 149	Moran Bros. Co., Seattle, Wash.
James Pierce	1, 664	Washburn Bros., Thomaston, Me.
James Tuft	1, 274	Henry K. Hall, Port Blakeley, Wash.
Joseph G. Ray	1, 253	Washburn Bros., Thomaston, Me.
James W. Paul, jr	1, 808	McKay & Dix, Verona, Me.
Kenwood	929	Wm. McKie, East Boston, Mass.
Kimberton	955	Palmer's Shipbuilding Co., Noank, Conn.
Kona	679	Hay & Wright, Alameda, Cal.
Lahaina	1, 067	Oakland, Cal.
Langhorn	955	Palmer's Shipbuilding Co., Noank, Conn.
Lejok	371	Sawyer Bros., Milbridge, Me.
L. Herbert Taft	1, 492	Thomaston, Me.
Logan	955	Palmer's Shipyard, Noank, Conn.
Mahukona	738	Geo. H. Hitchings, Hoquiam, Wash.
Malcolm B. Seavey	1, 247	Gardner G. Deering, Bath, Me.
Manheim	955	Palmer's Shipbuilding Co., Noank, Conn.
Marie F. Cummings	548	Leesburg, N. J.
Martha P. Small	2, 178	Percy & Small, Bath, Me.
Mary F. Barrett	1, 833	Gardner G. Deering, Bath, Me.
Matanzas	1, 579	Kelley, Spear & Co., Bath, Me.
Mindora	679	Hay & Wright, Alameda, Cal.
Miles M. Merry	1, 589	Parcy & Small, Bath, Me.
Newport	312	Kelley, Spear & Co., Bath, Me.
No. 6	1, 120	Harlan & Hollingsworth Co., Wilmington.
No. 21	905	R. M. Spedden Co., Baltimore, Md.
Oakley C. Curtis	2, 374	Parcy & Small, Bath, Me.
Orlando V. Wooten	677	New England Co., Bath, Me.
Otelia Pedersen	789	White's Shipyard, Everett, Wash.
R. J. Camp	703	Bethel, Del.
Rebecca Palmer	2, 556	Cobb, Butler & Co., Rockland, Me.
Robert Donaldson	389	E. James Tull, Pocomoke City, Md.
Robesonia	955	Palmer Shipbuilding Co., Noank, Conn.
Rockland	481	Kelley Spear & Co., Bath, Me.
Rutherford	955	R. Palmer & Sons, Noank, Conn.
S. D. Warriner	2, 279	American Shipbuilding Co., West Bay City, Mich.
Sagua	1, 585	Kelley, Spear & Co., Bath, Me.
Sallie C. Marvil	568	Copper & Saurhof, Sharpstown, Md.
Saucon	955	Palmer Shipbuilding Co., Noank, Conn.
Savannah	584	David Clark, Kennebunkport, Me.
Seguin	405	C. V. Minott, Phippsburg, Me.
Sophia Christensen	675	Hall Brothers, Port Blakely, Wash.
Springfield	633	New England Co., Bath, Me.
Trevorton	1, 763	Palmer's Shipyard, Noank, Conn.
W. H. Marston	1, 169	F. W. Stone, San Francisco, Cal.

List of sailing vessels over 250 tons built in 1901 in the United States—Cont'd.

Name.	Tonnage.	Builders and where built.
W. J. Patterson	645	Lindstrom's yard, Aberdeen, Wash.
Watson A. West	818	Do.
Weir	312	Kelley Spear & Co., Bath, Me.
Wempe Brothers	681	Lindstrom's yard, Aberdeen, Wash.
Whitman	477	Kelley Spear & Co., Bath, Me.
Wm. F. Garms	1,094	White Shipyard, Everett, Wash.
Wm. H. Yerkes	1,498	Washburn Brothers, Thomaston, Me.
William P. Frye	3,374	Arthur Sewall & Co., Bath, Me.
Total tonnage	95,031	

APPENDIX 2.

List of new American steamers of over 250 tons capacity built in 1901.

Name.	Tonnage.	Builder and where built.
Acme	416	Not known.
Alvina	526	Harlan & Hollingsworth Co., Wilmington, Del.
Apache	3,378	Wm. Cramp & Sons Ship and Engine Building Co., Philadelphia, Pa.
Arapohe	3,378	Do.
Arctic	392	H. R. Reed, Bay City, Oreg.
Argo	1,089	Craig Shipbuilding Co., Toledo, Ohio.
Bound Brook	1,016	Harlan & Hollingsworth Co., Wilmington, Del.
Buckman	1,820	Craig Shipbuilding Co., Toledo, Ohio.
Cape May	714	Harlan & Hollingsworth Co., Wilmington, Del.
Cartegena	1,532	James Davidson, West Bay City, Mich.
Carlisle	644	Neafie & Levy Ship and Engine Building Co., Philadelphia, Pa.
Charles S. Neff	992	Jenks Shipbuilding Co., Port Huron, Mich.
Chas. R. Spencer	474	E. W. Spencer, Portland, Oreg.
Chicago	3,195	Buffalo Dry Dock Co., Buffalo, N. Y.
Chicago	1,334	Burles Dry Dock Co., Port Richmond.
Christopher	4,260	Superior Shipbuilding Co., West Superior.
City of Rockland	1,696	Wm. McKie, Boston, Mass.
City of St. Joseph	691	Alexander Stewart, St. Joseph, Mo.
City of Trenton	469	Neafie & Levy Ship and Engine Building Co., Philadelphia.
Colonel	3,879	Detroit Shipbuilding Co., Wyandotte, Mich.
Cuba	594	Bath Iron Works, Bath, Me.
David M. Whitney	4,626	Detroit Shipbuilding Co., Wyandotte, Mich.
Denver	4,549	Harlan & Hollingsworth Co., Wilmington, Del.
El Dia	4,613	Newport News Ship and Engine Building Co., Newport News, Va.
El Siglo	4,616	Do.
El Valle	4,605	Do.
Esperanza	4,702	Wm. Cramp & Sons Ship and Engine Building Co., Philadelphia, Pa.
F. B. Jones	324	Tamas Ellington, Portland, Oreg.
F. T. Heflefinger	4,897	Chicago Shipbuilding Co. Chicago, Ill.
Frederick B. Wells	4,897	Do.
G. A. Flag	3,062	Superior Shipbuilding Co., West Superior, Wis.
George Garbutt	442	Thomas W. Garbutt, Wright, Ga.
George W. Peavey	4,997	American Shipbuilding Co., Cleveland, Ohio.
George W. Thomas	281	E. J. Howard, Jeffersonville, Ind.
Gilchrist	3,871	American Shipbuilding Co., West Bay City, Mich.

List of new American steamers of over 250 tons capacity built in 1901—Cont'd.

Name.	Ton- nage.	Builder and where built.
Gold Dust	490	E. J. Howard, Jeffersonville, Ind.
Hampton	580	Lewis Nixon, Elizabethport, N. J.
Harry B. Hollins	1,019	T. S. Marvel & Co., Newburg, N. Y.
Hawaiian	5,597	Roach Shipyard, Chester, Pa.
Hawalei	663	John W. Dickey, Alameda, Cal.
Henry Steinbrenner	4,719	Jenkins Shipbuilding Co., Port Huron, Mich.
Hugoma	2,182	Detroit Shipbuilding Co., Wyandotte, Mich.
Illinois	402	Quincy, Ill.
International	590	John Marr, West Haven, Conn.
Iroquois	1,163	Craig Shipbuilding Co., Toledo, Ohio.
J. S.	292	E. J. Howard, Jeffersonville, Ind.
John B. Collins	325	A. C. Brown & Sons, Tottenville, N. Y.
John English	1,022	T. S. Marvel & Co., Newburgh, N. Y.
John F. Carroll	510	Rodermond's Shipyard, Tompkins Cove, N. Y.
John J. Albright	4,805	American Shipbuilding Co., Cleveland, Ohio.
John S. Tompkins	593	Mound City, Ill.
Jupiter	3,719	American Shipbuilding Co., Lorain, Ohio.
Kennebeck	2,183	Jenks Shipbuilding Co., Port Huron, Mich.
Lake Shore	3,781	American Shipbuilding Co., West Bay City, Mich.
Lakeside	450	Craig Shipbuilding Co., Toledo, Ohio.
Lakewood	1,016	Harlan & Hollingsworth Co., Wilmington, Del.
Louise	335	A. D. Stevens, Jacksonville, Fla.
Lyra	4,417	Maryland Steel Co., Sparrow Point, Md.
M. F. Henderson	534	J. H. Johnson, Portland, Oreg.
Majestic	657	E. J. Heath, Everett, Wash.
Marion	262	Wilmington, Del.
Mars	3,748	Detroit Shipbuilding Co., Wyandotte, Mich.
Marshfield	388	Marshfield, Oreg.
Mary C. Elphicke	4,998	Chicago Shipbuilding Co., Chicago, Ill.
Mauch Chunk	4,499	Union Dry Dock Co., Buffalo, N. Y.
Meggido	250	M. J. Godfrey, Lyons, Ohio.
Meteor	2,301	Craig Shipbuilding Co., Toledo, Ohio.
Mills	2,525	Maryland Steel Co., Sparrow Point, Md.
Mineola	295	Port Clyde Marine Ways, Port Clyde, Me.
Minnetonka	5,270	American Shipbuilding Co., Cleveland, Ohio.
Monterey	4,702	Wm. Cramp & Sons, Ship and Engine Building Co., Philadelphia, Pa.
Morning Star	592	E. J. Howard, Jeffersonville, Ind.
Neptune	3,717	American Shipbuilding Co., Lorain, Ohio.
New Shoreham	503	Wm. McKie, East Boston, Mass.
New York Central, No. 6	453	Burlee Dry Dock Co., Port Richmond, N. Y.
North Beach	833	Townsend & Downey, Shooters Island, N. Y.
Northwestern	2,157	Chicago Shipbuilding Co., Chicago, Ill.
Northman	2,157	Do.
North Star	3,195	Roach's Shipyard, Chester, Pa.
Northtown	2,157	Chicago Shipbuilding Co., Chicago, Ill.
Northwestern	2,157	Do.
Oregonian	5,597	Roach's Shipyard, Chester, Pa.
Orion	1,736	George Johnson, Green Bay, Wis.
Ossian Bedell	296	Buffalo Dry Dock Co., Buffalo, N. Y.
Pathfinder	2,792	Harlan & Hollingsworth Co., Wilmington, Del.
Patience	202	John H. Dialogue, Camden, N. J.
Pennsylvania	394	American Shipbuilding Co., Cleveland, Ohio.
Pere Marquette	2,775	Do.
Puritan	1,547	Craig Shipbuilding Co., Toledo, Ohio.
Randolph S. Warner	3,062	Superior Shipbuilding Co., West Superior, Wis.
Saturn	3,717	American Shipbuilding Co., Lorain, Ohio.

List of new American steamers over 250 tons capacity built in 1901—Cont'd.

Name.	Ton- nage.	Builder and where built.
Springfield	287	The Pusey & Jones Co., Wilmington, Del.
Standard	374	Burlee Dry Dock Co., Port Richmond, N. Y.
Tamalpais	1,554	Union Iron Works, San Francisco, Cal.
Thomas Patton	875	T. S. Marvel & Co., Newburg, N. Y.
Two States	362	John M. Graham, Savannah, Ga.
Uranus	3,748	Detroit Shipbuilding Co., Wyandotte, Mich.
Valetta	419	W. D. Delaney, Benecia, Cal.
Venus	3,719	American Shipbuilding Co., Lorain, Ohio.
W. H. Paringle	575	Louis Pacquet, Pasco, Wash.
Walter Scranton	4,803	American Shipbuilding Co., Cleveland, Ohio.
Watson	1,820	Craig Shipbuilding Co., Toledo, Ohio.
West Point	1,328	T. S. Marvel & Co., Newburg, N. Y.
Will H. Isom	938	Thomas Dunbar, Ballard, Wash.
William L. Brown	4,938	Chicago Shipbuilding Co., Chicago, Ill.
William S. Mack	3,720	American Shipbuilding Co., Lorain, Ohio.
Yozemite	3,879	Detroit Shipbuilding Co., Wyandotte, Mich.
Zulia	1,713	Neafie & Levy Ship and Engine Building Co., Philadelphia.
Total tonnage	288,743	



